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Rough Notes of an Exploration for an Inter-oceanic Canal Route by way of the Rivers Atrato and San Juan, in New Granada, South America.

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(Continued from p. 299.)

Quibdó is situated on the east bank of the Atrato, at the confluence of that river with the Quíto and Cabí. (See Plate XII.) It stands on one of three or four contiguous isolated hillocks of gold-gravel and clay. The highest points of the site, parallel with, and close to the river, are some six or seven feet above the highest freshets, but decline inland, so that at a few hundred yards back from the town, the water of high floods completely surrounds it. Owing to the incessant rains, even the high parts are reduced to a marshy condition, and a deviation of a few rods from the paved portions generally entails the penalty of muddy feet, or even of muddy knees, to one who does not happen to know where the hard spots are.

The space occupied by the town could readily be drained by a judicious system of ditching, and with but little labor or expense. By this means an area of about a quarter or one-third of a square mile might be rendered applicable to building purposes. As it is, we could stroll in no direction for more than five minutes without being turned back by swamps. High wooden clogs are in general use among such of the inhabitants as indulge in the luxury of boots or shoes, although I consider it very doubt-

ful whether any of that class has ever walked about the town for ten continuous minutes unless on occasions of religious processions. Many of the better class, especially the females, live and die without having walked a mile at a time during their lives.

Where the sphere of pedestrianism is restricted within such narrow limits, it might be supposed that the precaution of carrying an umbrella as an ordinary appendage, might well be dispensed with. But such is not the case, for the frequency of showers, which come up with scarcely a moment's warning, renders an umbrella indispensable at all times on leaving the house for even half an hour.

The authorities of the town have for a long time been compelled to forbid the washing for gold in the gravel on which it stands. But for this precaution the river banks would have been undermined, and the whole town plot filled with holes. It is true, that the gravel here is not very rich in this metal, nor, indeed, is it searched for in any part of the main Atrato below Quibdó, although found in quantities in the upper portions of *all* the eastern tributaries. On this account, I at first supposed that Quibdó was so far removed from the sources of the gold in the western Cordilleras, that the force of the current of the Cabí, and Quíto had not been sufficient to transport the particles to that point. But, as I afterwards saw very rich deposits at greater distances from the place of origin, I was obliged to abandon this idea, and to substitute for it that of a casual inequality of distribution.

There are no wharves or other provisions for the convenience of discharging boats, further than a few stout stakes firmly driven, to which they may be secured. The river banks descend to the water's edge very abruptly, and one must crawl up, or slide down, the best way he can. Just after a shower, when the banks are particularly slippery, this is a feat requiring both care and agility. One of the landing places was just in front of our house, and I have frequently been obliged to use a pole in order to surmount it.

It is dangerous to employ the hands for ascending the bank on all fours, inasmuch as every blade of grass has its colony of yavís, which attach themselves to the flesh, and unless detected and removed, insert themselves into the skin, producing a very troublesome itching for several days. The mere picking up of a stick to walk with, or the searching for specimens of any kind among the grass, was sure to be attended with this annoyance. How the natives become hardened to it, I cannot conceive, but so they do. We found yavís at every point of our exploration, from ocean to ocean.

Sitting on our balcony, which almost overhung the river, I could cozily smoke my early morning segar, while exchanging salutations with the young ladies who resorted to this spot about sunrise to bathe. No imaginable impropriety was involved in these innocent chit-chats, as I am, myself, a model of modesty; and the ladies, with the most becoming sense of decorum, rarely exposed their persons much more than half way down, or if they did, were sure to tie a handkerchief in front, or throw one over their shoulders. Sometimes, it is true, an antiquated specimen of the "strong minded woman," scorning the restrictive conventionalities of society, would divest herself entirely, and flounder about *in puris natu-*

J. C. T. del.

P.S. Duval & Col. Steam lith. Press Philad.

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ralibus, probably with a segar in her mouth. If the "woman's rights" advocates succeed in their rebellion, we may reasonably hope soon to see our own ladies adopting these tropical customs, in connexion with which, I would humbly suggest the gratification they would derive from learning to dive with a lighted segar in the mouth. Paradoxical as this proposition may appear, the process is quite simple, and the art by no means difficult of attainment. Nothing is more common in many parts of New Granada, than to see persons of both sexes smoking with the lighted end of the segar in the mouth. This does not interfere with their volubility, and I have repeatedly seen swimmers dive to a considerable depth, without extinguishing their segars, or supposing they were performing anything extraordinary.

The water nymphs would sometimes indulge in a song, which, as they all affect a most distressing nasal twang, generally drove me into the house. It is difficult to imagine any thing (unless it be a choice passage in the Italian opera,) more excruciating than a quartette vigorously emitted through the nose, with the force which none can apply as do these unsophisticated syrens of the Atrato. Nor is this peculiarity (which evidently has its prototype in their church music,) confined to the females; the males, also, are afflicted with it. Our boat's crew were singing as they worked, from morning till night, and when occasionally a little boy, a fellow passenger, actuated by a laudable spirit of rivalry, added his feeble treble to their sonorous sniffles, a harmony was produced suggestive of a duett on the nose between a lion and a tomtit.

Our landing place was not only resorted to by bathers, but served as a kind of "Rialto where servants most do congregate." These would be seen, early in the morning, filling their earthen jars with drinking water for the day, and chatting merrily with others, who, within ten feet of them, would be emptying and washing utensils of a very different character. The sensitiveness with which we recoil from certain associations of the agreeable and the disagreeable, in matters of culinary or gastronomic character, forms no part of the Granadian creed, at least among the commonalty. I actually, on one occasion, detected my black cook paring his toe nails with the carving-knife; and have frequently seen the lower classes while eating with their fingers, suspend operations for a moment by particular request, to relieve the head of a neighbor from a few entomological specimens, without being at all choice as to the direction in which they were thrown when captured.

The houses in Quibdó are, with very few exceptions, one story in height, and constructed chiefly of split palms and canes, with a small proportion of hewn timber. The floors of the poorer kind are of earth, while those of superior class are formed of split strips of the outer part of the palm, boards, or brick. Two or three, which were formerly occupied by persons of wealth, while the country was subject to Spanish dominion, have floors of tessalated Italian marble, which forms an odd contrast with the perishable materials of the walls. The roofs are generally thatched with palm leaves, but some are covered with earthen tiles made at the town. These tiles are merely laid on the woodwork of the roof, at a pretty steep angle, without any fastening, inasmuch as winds sufficiently strong to displace them are almost unknown in Quibdó.

The constant heat of the climate precludes the necessity for glass in the windows, which are merely protected by cross-bars of wood or iron. The entire details of construction would be considered very rude with us; nevertheless, the buildings are comfortable and commodious, to one who can lay aside his predilections for finished workmanship, and become oblivious to the interstices in most of the partitions, which conflict shockingly with our ideas of privacy.

No precaution is adopted against fire, except the nightly patrol of a watchman, although the combustible materials of which the houses are built, would insure its destruction in a few minutes.

Nearly every house is a shop, in which the systems of selling and bartering extend to every imaginable object that can be procured to sell or barter. Occasionally, by chance, a few articles of comparative luxury find their way here from Carthagena. Among these, Mr. McCann, after diligent search, discovered some sardines, bottled ale, and claret, the whole of which we purchased for our remaining trip, and, as the result proved, it was very fortunate for us that we did so.

Some portions of the side-walks of the town are roughly paved with large rounded pebbles.

About 70 years ago, Quibdó consisted of but two or three Indian huts, and was known as Citará. It is still frequently called by this name, (and occasionally by that of Chocó,) in the neighborhood.

The population is about 1500. Of these, the greater portion, (perhaps two-thirds,) are blacks, and the remainder Indians, with a few whites, as is the case in most parts of the Republic.

Quibdó is the emporium of foreign merchandise for a great extent of very sparsely populated territory. It is all procured from Carthagena, and some idea of its limited amount may be formed, from the fact, that its transportation requires but about one boat of from 20 to 30 tons burden, monthly. The average value of the cargoes usually ranges between $2500 and $5000; so that $50,000 may be considered a liberal estimate for the amount of foreign merchandize annually consumed in Quibdó, and the adjacent region. The great bulk of the articles is of inferior quality, adapted to the necessities and primitive tastes of the poor and semi-civilized negroes and Indians, among whom it is distributed.

Of these, the former generally pay for their purchases in gold dust, and the latter in the produce of their little "rosas," or patches of cultivated ground. The Indians here are strongly averse to searching for gold, probably a consequence of their traditional sense of the horrid barbarities which its possession entailed upon their ancestors at the time of the Spanish Conquests. They conceal all knowledge of rich localities, and even take the trouble to obliterate evidences of their existence, when it is in their power to do so. The blacks, not being burdened with such disagreeable reminiscences, have no scruples in hunting for gold; indeed, it constitutes the principal active occupation of the greater proportion of them; many are refugees from justice from every part of the Republic, who find a secure retreat from pursuit in the fastnesses of the forest-covered mountains, in the defiles of which their searches are conducted.

It is needless to remark that their operations are carried on without

the aid of science or system. Each one hunts for himself, and a calabash or wooden bowl comprises the inventory of his machinery. Aiming at nothing more than barely to supply the absolute necessaries of his vagabond existence, (which exact but few more appliances than those possessed by the beasts of the forest,) it may well be imagined that his exertions are light, and their result correspondingly insignificant. Still, Dr. Key informed me that in consequence of the numbers employed in this avocation, the gold dust annually brought into Quibdó, amounted in value to about $200,000. It is carried to the stores in very small quantities, frequently tied up in a leaf by the tendril of a vine. Thus gradually accumulated, it constitutes almost the sole medium of payment for the merchandize purchased in Carthagena.

The store-keepers are careful to apprize the gold hunters of its real value, as estimated in coin. By this means strangers are prevented from making great bargains in the precious commodity, as they would have to pay for it, very nearly its actual value; whereas, the store-keepers themselves, obtain it in barter for their goods, upon which they fix prices "ad libitum."

Beside the articles of foreign importation which are carried from Carthagena to Quibdó, such as textile fabrics, groceries, crockery, &c., there are some provisions of home production, such as yams, rice, cheese, jerked beef, &c. Paucity of population, combined with indisposition to labor, prevent these from being raised in the immediate vicinity in quantities sufficient to supply the demand arising from 1500 stomachs. There is no cultivation whatever, immediately contiguous to the town, but the supplies of such articles of food as the natives raise, are brought from the little rosas prepared along the levees of the Atrato and its branches, for many leagues around; and even from the valleys of the Cauca, Baudó and San Juan.

From the immense extent of country in which gold here exists in large quantities, in combination with the inducements offered to immigrants by the government of New Granada, I cannot doubt that when the lapse of a few years shall have served more fully to extend the knowledge of these facts, an excitement and influx of foreigners to the slopes of the Western Cordilleras, will take place, exceeding even those attendant on the discoveries in California and Australia.

Here, not only gold, but platina abounds; and in sections of the Republic more to the eastward, mines of silver and copper have for a long time been profitably worked. Most of the platina is, at present, derived from the vicinities of San Pablo, Nóvita, and Lloró. Near Bogotá, (the seat of government of the Republic,) are the celebrated emerald mines of Mussa, and no doubt can exist that when the country shall have been subjected to a proper geological examination, mineral treasures will be found as richly disseminated as in any known part of the earth.

There is no reason, whatever, to doubt that an almost uninterrupted deposit of the precious metals extends through the entire western portion of both Americas, from the extreme north to the extreme south.

Perhaps the chief, if not the only, extensive interruption of this great deposit, will be found to be where the igneous rocks of the Cordilleras are replaced by the slightly elevated transition formations that occupy the

region comprised between the Carribbean Sea on the northeast, and the Pacific Ocean on the southwest, and through which flow the rivers Guácuba, Atrato, and San Juan.

Through this region, there appear to me to be indisputable proofs that the waters of the Pacific and Atlantic were united at no very distant geological period. The only rock I saw in place between the Gulf of Urabá, and the Pacific at Buenaventura, was a gray tertiary sandstone, of various degrees of induration, from that of merely semi-indurated arenaceous clay, up to hard, perfectly formed stone. In every instance it contained fossil shells. I met with it at both the points at which I crossed the partition ridge between the Atrato and the Pacific, as in all the low parallel lines of hills which I have represented on the Map, (Plate XII,) as bordering the Pató, the Baudó, the Surúcco, and the San Juan. The same rock is found at the same ridge in crossing from the Napipi to Cupíca.

Gold has, I believe, been nowhere found to the west of this transition ridge of partition; but to the east of it, from below the latitude of San Pablo, it everywhere occurs in the diluvial gravel up to the very foot of the ridge. Near the head of the Surúcco I saw negroes washing rich gold-gravel at an elevation of some 30 feet above the level of the stream. These I conceive to be incontestible proofs that the gold-bearing diluvium has been spread over this region at a period subsequent to that of the elevation of this ridge. If so, it is inferable thatt he Western Cordilleras, themselves, have undergone, at least, a partial upheave since the elevation of the partition ridge, as otherwise it would be difficult to suggest a tenable theory for the dispersion of the diluvium.

Dr. Halsted, who had visited some of the gold regions of California, pronounced this spot on the Surúcco to be as rich as any he had ever seen, although it was near the extreme western limit of the auriferous diluvium, and consequently, the farthest removed from the original place of deposit.

Violent winds are of so rare occurrence about Quibdó, as to be almost unknown. Those from the north and north-east, which prevail during the months from December to March, near the Gulf of Urabá, lose themselves in ascending the Atrato, until they nearly die away about the mouth of the Murrí. To this point boats have ascended during the season of the northers, by the aid of sails only.

Situated so near the equator as latitude 5¾ degrees north, and at an elevation of less than 100 feet above the level of the sea,* it may readily be imagined that when the sun shines brightly, the heat at Quibdó is

* A comparison between two sets of careful in-door observations of my barometer, at Carthagena and Quibdó, give the elevation of the latter above the level of the sea, at about 70 feet; whereas, a mean of those taken at Túrbo, gives about 100 feet. If we assume the average fall of the Atrato for 220 miles from Quibdó to the Gulf of Urabá, to be three inches per mile, (which cannot, possibly, be far from the truth,) we should have a total descent of the river itself of 55 feet, to which may be added about 15 feet for the ordinary elevation of the town above the river, making 70 feet. Upon this data, I assume above, that Quibdó is not more than 100 feet above the level of the sea. I regard the elevation deduced from my occasional levels of the descent of the Atrato, as more dependable than those derived from the barometer; inasmuch as the indications of this instrument are subject to many irregularities which prevent it from furnishing correct results. The mean of the three calculations gives 80 feet.

great. Fortunately, however, the almost constant prevalence of mists and clouds serves to mitigate its intensity to such a degree that I found the usual temperature in the open air to be less oppressive than at Carthagena, and at other points at the same level in much higher latitudes, but possessing a clearer atmosphere.

I suspect that there are few places on the face of the earth where rains are more frequent than in the region about Quibdó. It probably does not happen twenty times in a year, that twenty-four successive hours pass without more or less rain.

During our stay of two months, it took place but twice, although once we had the *very unusual* occurrence of three consecutive days in which the only rain that fell was in light showers at night. The river empties itself rapidly during intermissions of rain about its sources, and this last occasion was attended by the lowest stage of water we saw at Quibdó, namely, about five feet in the deepest part of the channel in front of the town.

Late in the afternoon of the last of these three dry days, there came on a tremendously heavy rain, attended by he most vivid, blinding, and literally incessant lightning, and the most prolonged and fearfully heavy peals of thunder, that I ever saw or heard. For one hour, I do not think there was, at any moment, an intermission of startling flashes for one second; and during that time the roar of the thunder resembled the continuous discharge of heavy batteries in the street, and on the roof of the house. At times the sound appeared to be between us and the roof, and we expected every moment to have the building down on us. The wind was quite moderate during the storm (which lasted only two hours) shifting first from east to west, and then to the north. The barometer exhibited no unusual disturbance either preceding or during the storm.

Just one month after our arrival, Dr. Key sent in a hurry to inform me that the atmosphere was sufficiently clear to allow the Cordilleras to be seen from near his house. On going to the spot, I found them to be very plainly discernible, but a re-gathering of the mist shut them out from view in a few minutes. This was the only occasion in which they were visible from Quibdó during our two months' stay.

It was not until the night of the thirty-sixth day after our arrival, that the sky was sufficiently clear to allow us to observe the stars for determining the latitude of the town. This also, was the first night on which no rain fell.* I suspect that more than three-fourths of the rain falls

* It was in consequence of the cloudiness of the nights, that we determined so few latitudes. Only that of Quibdó, which we had two or three opportunities of verifying by both northern and southern circumpolar stars, can be depended upon for accuracy. We were sometimes much troubled by the deposition of dew on the glasses of our pocket sextants, while observing, and as, from the construction of the instruments, we could not wipe them at a moment's notice, it is most probable that our other latitudes may be in error a few minutes. None of them vary more than five minutes from those given in Acosta's Map, except that of Vigia Curbarador, which I place fifteen minutes more to the south than he has it. Being confident, that in the case of Quibdó, he is slightly in error, I have also retained my other positions, notwithstanding their chance of inaccuracy. The position of the Vigia, moreover, agrees quite well with my protraction of distances. The nights on which the observations were taken for Quibdó, were perfectly clear at the time.

during the night. The clouds generally begin to increase in density sometime during the afternoon, and if rain does not commence at that time it is pretty sure to do so early in the evening, and continue during a great part of the night.

The "dry season," emphatically so called, is a period of but from 5 to 10 or 12 days, which occur during the veranillo de San Juan or short summer of St. John, generally some time in June. During this short interval, there is considerably less rain than usual, and the river gets down to its lowest stage. With this exception, and a somewhat similar one, which generally takes place in February, the Atrato rises and falls within nearly the same limits in almost every month.

The lower classes do not burden themselves with much dress; and it is quite common to see laborers and boatmen walking the streets with no other vestment than a piece of rag tied around the middle. The Indians sometimes resort to the less expensive substitute of painting their bodies. The first specimen of this operation that fell under our notice, was at the mouth of the River Opagadó, where we stopped for one night. An Indian dance was to take place that evening within a few miles, and an Indian woman nearly naked, was painting a pair of black breeches on her husband, who was otherwise entirely destitute of clothing. Squatted on the river bank in front of their hut, with a calabash of black dye between them, she was liberally smearing the contents over him with her hands. They resembled a brace of solemn baboons at mischief over a tar pot. He had a cable of strings of beads around his neck, while his wrists were graced with silver bracelets about six inches deep, resembling two beer mugs with the bottoms knocked out. When the breeches were finished, she added a pair of suspenders, and then, by way of finale, applied two or three spats of color to his snout, when, lo! before us stood the beau ideal of the Indian dandy of the Atrato,—the "finished gentleman from top to toe." She regarded him for a moment with admiration,—"He was all her fancy painted him." He, gazing for a moment at the neat fit of his pants, emitted a grunt of satisfaction, then seized his paddle, and with two bounds down the steep river bank, sprang into his little canoe, and shot away to the dance.

Black and red appear to be almost the only colors used, and their employment, so far as I observed, was confined to the Indians; the negroes not appearing to have much taste for this branch of the fine arts.

On the San Juan, we afterwards met with some tattooed Indians.

The passion for gambling pervades, more or less, all classes. Those of the lower grades seem to be actually impatient to get rid of their money as fast as they earn it; and surplus funds are sure to vanish at cards, or a cock-fight, at the earliest opportunity that offers.

All classes, when properly approached, evince an almost innate courtesy, and desire to please. During a residence of several years in New Granada, I have been repeatedly brought into contact with persons of every grade, from the highest to the lowest; and from all alike I have invariably experienced the freest hospitality, and unfailing courtesy. This latter trait of character actually appears to be inborn, and not the result of education. Ask any little naked Señor Caballero Jesus, or

equally naked little Señorita "Concepcion de la Virgen,"* whom you may chance to encounter in the street, to allow you to light your segar by the one he or she may be smoking; it is instantly presented in a graceful manner, with a "con mucho gusto Señor," (with much pleasure, sir.) The youngest child will never be seen to laugh at your deplorable efforts at speaking Spanish, but will listen and reply to you with a decorous gravity that might shame a Senator.

I never, in all my Granadian experience, felt myself to be among ruffians; and the only precaution necessary to ensure the kindness and good will of all, is, merely to conduct yourself in a manner deserving of them. It is to be regretted that this simple means of attaining so desirable an object should be so seldom resorted to by either the English or Americans who travel among them, and who appear to rely more upon a snobbish and vulgar assumption of superiority, which, while it is almost invariably endured with forbearance and politeness, fails in effecting more than a conviction, on the part of their auditors, that their guests are, at least, extremely ill bred. A thousand times have I had reason to be ashamed at the contrast between my own countrymen and even the lowest classes of New Granadians, in point of conventional courtesies. John Bull and Brother Jonathan, with all their boasting, are, so far as my opportunities of observation extend, the most unfit (money and courage excepted,) of all the nations of the earth, to travel with enjoyment to themselves and to those with whom they are brought in contact. The French, Germans, Spanish, indeed, the representatives of all the nations with whom I have met in my wanderings, enjoy an aptitude of assimilation, a certain faculty of being happy, and making others happy, an ease of conformity to the customs of the place in which they happen to find themselves, for which we look in vain, in the owl-like, stolid, self-sufficient, bull-doggedness of the Anglo-Saxon race. Among the Indian tribes through which I passed, I laid aside my pistols, and armed myself with a pocket full of segars; a present of an empty sardine box was more effective than a two-edged sword; and a lump of our sugar to a papoose was a better passport than my government could have furnished.

As to musquitoes, we saw but few on the Atrato, except for the first few nights above the Gulf. Even these we should have avoided had our patron been willing to anchor his boat a little further out in the stream. Some portions of Quibdó, in which little attention is bestowed upon cleanliness, are troubled with them; but I do not remember to have seen one in the house we occupied. There are a good many fleas, however, or a species of diminutive sand fly, that at times annoy very much.

The Republic of New Granada is divided into thirty-seven provinces, which sustain, towards the general government, a relative position, similar to that of our own States. These, again, are subdivided into cantons and parochial districts, corresponding to our own counties and townships.

The province of Chocó, of which Quibdó is the capital, comprises the greater portion of the territory shown in the map, Plate XII. I have, unfortunately, mislaid the memorandum of its precise limits, as furnished by Governor Contó. According to the census of the Republic for 1851,

* "Gentleman Jesus;" "Conception of the Virgin;" not uncommon names.

a copy of which was kindly prepared for me by his order, the population of the province of Chocó is as follows:—

Canton of Atrato.

District of Quibdó,	.	8471
" " Arrayanál,	.	1125
" " Bebará,	.	4034
" " Lloró,	.	4035
" " Murri,	.	2009
" " Murindo,	.	2007
" " Túrbo,	.	916
		——22597

Canton of San Juan.

District of Novita,	.	6097
" " Baudo,	.	3036
" " Noanamá,	.	3510
" " Sipi,	.	2021
" " Tado,	.	6388
		——21052
Total of Province of Chocó,		43649

According to the same census, the population of the entire Republic amounted, in 1851, to 2,243,730.

After a stay of four or five days in Quibdó, I determined to prosecute my explorations by ascending the Pató, a branch of the river Quíto, which heads in the dividing ridge between the waters of the Atlantic and Pacific. At Quibdó, the Atrato divides into two principal branches of about equal size. That to the east still retains the name of Atrato, while the western one is called the Quíto. The tributaries of the Quíto branch flows almost entirely through diluvium, and consequently its waters are yellow and muddy; while those of the Atrato branch, having their sources in the Western Cordilleras, and flowing principally through channels of rock and pebbles, are quite transparent. For some distance below the junction of the two at Quibdó, the line of separation between their respective waters, is well defined. The Atrato, not being at all available for the object of which I was in pursuit, it only remained to ascertain what facilities were offered by either the Quíto, or its tributaries, for effecting a union with the waters of the Pacific. It had been suggested to me at Quibdó that I should find the route by the Pató in conjunction with the Baudó, which empties into the Pacific some 50 miles above the San Juan, to be preferable to that by way of the Quíto and San Juan itself.

On reference to Acosta's map, I found the Baudó laid down as quite an insignificant stream, which fact augured badly for the successful result of that portion of my examinations. But as my authorities in Quibdó were unanimous in their assurances that I should find the Baudó to be a far more important river than the map represented it, I resolved to hazard a few days in paying it a visit.

The opinion as to the height which I should find the partition ridge to attain were somewhat diverse, varying between 18 feet, and 4000 feet. The first limit was stoutly maintained by Father Ochóa, the high priest (stature about 5 feet 3 inches) of Quibdó and the adjacent precincts, "to whom we were indebted for several agreeable visits, pro and con, during our stay." "He had been a soldier in his youth, and fought in

famous battles," which supplied him with a great fund of anecdote. The old gentleman had unfortunately acquired among his flock a reputation for shooting an "almighty long bow," but notwithstanding the several intimations to that effect that had been conveyed to me, I felt rather inclined to pin my faith to his skirts, inasmuch as in our numerous conversations he appeared to evince habits of close observation, and I thought (my wish being father to the thought) that his asseverations might not only prove to be correct, but conduce to my achieving a small slice of immortality by the discovery of a feasible inter-oceanic communication.

I was, however, somewhat staggered by the assurance, (accompanied by a diabolically ominous shrug of the shoulders,) of one person who had crossed it two or three times, who, although he could not pretend to speak with any certainty as to the precise height, yet assured me that it would prove to be "algo" (somewhat). The sequel will show that I found his estimate to be the correct one.

I had supposed, like a simpleton, that in order to start on my pilgrimage, nothing more would be necessary than to go down to the landing, engage a canoe, and two or three paddlers,—tell them to put my traps and a few plantains on board, and be off at ten minutes notice. Consequently, early one morning, following the example of my thermometer, I rose with the sun, went to the landing, and accosting the owner of a canoe, bade him gird up his loins, and bring his boat around to our landing place, in order to load up with more facility.

He very courteously asked me for a light, and after having gravely set his segar in operation, told me he could not comply. The voyage was a long one, and required a good deal of deliberation and consultation among his kinsfolk,—provisions were very high just then,—himself and his family were victims to all sorts of distressing maladies,—his canoe leaked and would require repairs,—it was going to rain, (a truism at all times in Quibdó,) and besides, to-morrow or next day, would be time enough.

The inexperienced traveler on the Spanish Main is very apt to be continually annoyed by the dilatory habits and procrastinations of all with whom he has business to transact. This should not (as is usually the case) be imputed to them as a fault, but rather as a natural consequence, resulting from the heat of the climate, and the absence of those incentives to activity engendered by a more extended commerce or a general devotion to agricultural pursuits. The traveler from colder regions should therefore make ample allowances for these considerations, and temper his impatience down to the standard of inactivity which prevails in all tropical climates. Otherwise, he will be kept in an incessant fidget and ill humor; for no matter how pressing may be the occasion, how solemn the promises, how urgent his importunities, he is constantly met with the eternal "poco a poco," "mañana;" ("by and bye," "to-morrow.") "Take it coolly," "dont hurry yourself," "dont do to-day what can be done to-morrow," "time comes as fast as it goes," constitute the grand fundamental axioms of business operations; from the most important, down to the most trifling incidents of every day's occurrence. Do you complain? You are consoled by the assurance that it is the "costumbre del pais," (the custom of the country.) And so it is; therefore, the sooner

you learn to conform to it, the sooner will you be relieved from a most prolific source of irritation.

After applying to two or three other canoe men, with a result as unfavorable as the first, I stated my case to Dr. Key and Governor Contó, both of whom volunteered their services in my behalf. The consequence was, that by the end of five days more, I had secured a good trustworthy Indian patron, three bogas, and a ranchâda. The only shelter afforded by the latter from the inclemency of the weather, was a little "toldo" or covering made of bent pieces of vine covered with long "musa" leaves. This toldo was 9 feet long, 3 feet wide, and 3 feet high in the centre. The ranchâda was 43 feet long, by 12 inches deep; and drew, with our load, 6 inches.

Expecting to be absent only four or five days, we laid in but a small stock of provisions, a single change of clothing, our hammocks, and a gun. These, however, occupied so much space in the toldo, that it was impossible to stow into it more than two persons in addition, and even they required to be coiled up tightly. It was therefore decided that Dr. Halsted and myself only should go, while Mr. McCann remained behind to continue the observations on the stages of the river.

It was nearly 11 o'clock in the morning when we started to ascend the Quíto, and we reached a negro rancho near the mouth of the Pató, a distance of 17 miles above Quibdó, at 6 P. M.

As there was no other stopping place for a long distance ahead, we landed here, and requesting permission to pass the night in the house, received the invariable affirmative answer. The Doctor and I soon sat about getting supper, and had we practised all the incantation of Pharaoh's magicians we could scarcely have excited more wonder on the part of our worthy host (a venerable negro) and his family.

They had heard me address Halsted, as "Doctor," which is a word pregnant with mystery and great meaning among them, and prepared them for extraordinary things.

Squatting around us on the floor of the hut, like so many stripped mummies, they watched with intense interest the mysterious process by which Dr. Halsted was preparing our coffee, while I opened a box of sardines and a bottle of claret.

"Holy Virgin!" at last exclaimed the old man, striking his breast in an agony of astonishment, "can these blancos (whites) be men, or are they devils; they come into a poor man's house where there is no coffee, but they have coffee in their pockets; they pour some water (alcohol) under a machine (portable coffee maker) and some into the machine; they set fire to the water under the machine, with fire which they carry in a piece of paper in their pockets, (lucifer matches;) the coffee is ready, and then they put out the fire with a silk handkerchief;" (the Doctor extinguished the flame by laying his handkerchief on it.) "They must be devils," "they carry with them little fish in a silver box, they have wine, they have bread, they have everything; they must be devils." As we made him share with us, however, some portion of our delicacies, winding up with segars, and a calabash of brandy and water, he must have concluded at least that we were a set of good natured devils. Poor old fellow, I am afraid the Doctor kept him awake all night by showing him before

he turned in, our compass pointing to the north, while the compass-box was turned completely around; and afterwards making the needle chase a knife-blade: for as soon as this miracle was performed, he silently rose, and without saying a word, went out, and squatted down on the river bank with his head between his hands, evidently lost in deep meditation.

Next morning he refused any compensation for his kindness, except the claret bottle, and sardine box; and I suspect felt relieved when our boat paddled away.

(To be continued.)

AMERICAN PATENTS.

List of American Patents which issued from April 4th to April 25th, 1854, (*inclusive*,) *with Exemplifications by* CHARLES M. KELLER, *late Chief Examiner of Patents in the U. S. Patent Office.*

APRIL 4.

1. For *Improvements in Drop and Die Forging and Punching Machines;* Solomon Andrews, Perth Amboy, New Jersey; patented in England, Oct. 7, 1852.

Claim.—"What I claim is, 1st, Lifting the drop or staff, near its central line of gravity, by means of a pinion running on a shaft operated by a clutch, combined with the driving power, whereby the stamp may be released and dropped at any point of its ascent, at the option of the attendant, and without stopping the other moving parts, as described. 2d, Hollowing out the stamp, and also the punch, for the formation of a reservoir to hold water or other proper fluid for keeping the punch cool, not limiting myself to a punch merely, but also as applied to any other tool fitted to, or used in combination with, a stamp for operating upon hot metals. 3d, Interposing between the stamps and the die, a secondary stamp or follower, so constructed as to effect the cutting off of the blank from the bar, and when combined with the bolster shall form the box or die in which the nut is forged, and which secondary stamp shall also act as a releaser to remove the finished nut from the punch, as described. 4th, The combination of the cam lever and the arc with the stem of the lower or discharging die, to be operated by the stamp during its ascent, in order to raise and support the lower die until the nut is thrown off, as described. 5th, The wedge-lever, in connexion with its spring and its lever or arm, operating as described, for effecting the complete disengagement of the clutch teeth, so as to prevent those from clashing when the stamp falls, the whole being constructed and operating as set forth."

2. For an *Improvement in Railroad Chairs;* Bernard J. La Mothe, City of N. York.

Claim.—"What I claim is, the construction of the frame of railroad cars with continuous elastic steel bands, or equivalent material, in the manner and for the purpose set forth, namely: the transverse bands, in pairs, each of one single piece, to extend from one side of the frame to the other, at equal or respective distances, bent to the proper shape of the car, and the longitudinal bands to pass, single, between the above, forming, with them, rectangular squares, and the three bands repeatedly in such position to be firmly secured together by means of rivets or screws in each intersection of the rectangles formed by them; thereby obtaining with said material, and from such an arrangement, combined with lightness, far greater strength and elasticity than the cars now in ordinary use possess, and consequently affording far more protection to life, in case of accidents, in railroad traveling. I do not claim the frame of single transverse and single longitudinal bands, but limit my claim to the use of single, double, triple, or multiplied longitudinal bands, combined with single, double, triple, or multiplied transverse bands, so that there shall not be less than three bands, while the number may be increased ad libitum, in each intersection of the angles formed by them, the whole being constructed and used in the manner and for the purposes above mentioned."

3. For an *Improvement in Treating Cane Fibre for Paper and other purposes;* B. A. Lavender and Henry Lowe, Baltimore, Maryland.

Claim.—"What we claim is, breaking down woody fibre of cane, and other like plants, and dissolving the gummy and other foreign matters therefrom, by means of muriatic or sulphuric acid, of the strength of 10° Baumé, or thereabout, preparatory to making hemp for bagging, rope, paper, pulp, &c., in the manner substantially as set forth."

4. For an *Improvement in Carriage Tops;* Rodney Miller, Middlefield, Ohio.

"The nature of my invention consists in so constructing a carriage top and seat, that a person upon the seat can, without rising from the seat, easily raise and lower the top by placing his foot or hand on the lever at the right of the seat, the lever being held in place at the desired point by catches upon the seat."

Claim.—"What I claim is, the combination and arrangement of the rods or straps, either separately or combined with the cranks and the arms, in the manner specified, and operated by the lever, for the purpose of raising and lowering carriage tops in the manner set forth."

5. For an *Improved Chain Cable Stopper;* Oldin Nichols, Lowell, Massachusetts.

Claim.—"What I claim is, preventing the backward slipping of the cable as it is drawn inward, by my improved method of providing a catch for every link by means of the roller, supplied with the projections, recesses, and ratchet teeth, in connexion with the pawls, all arranged and operating together upon the cable substantially as set forth."

6. For an *Improved Chain Cable Stopper;* Oldin Nichols, Lowell, Massachusetts.

Claim.—"What I claim is, the small guiding ridge in the bottom of and combined with the encircling groove, or its equivalent, in the sustaining roller, so as to cause the links of the chain to assume positions sufficiently inclined to be guided alternately on opposite sides of said ridge, for preventing the twisting of the cable, but at the same time to bring each link, against which the pawl acts, so near a vertical position as to be securely held by said pawl, substantially as described."

7. For an *Improvement in Gates for Water Wheels;* Elijah Roberts, Rochester, N. H.

"The nature of my invention consists in the arrangement of the devices by which the water has an advantageous direction given it in passing through the adjustable shute, combined with the sliding for operating the shutes, or the divisions constituting the shute; also in the mode of hanging these divisions on a fixed rod passing loosely through the shutes, by which means the clamping of them is avoided when the bolts holding the rims together are tightened, and, furthermore, in the device for simultaneously opening these shutes by an annular ring, gear, &c. It is to be understood there is no difficulty of the shutes closing, the water will do that when free from obstruction."

Claim.—"What I claim is, the arrangement of the rods, which are made to slide through the shutes or gates, so that all the gates or shutes may be opened simultaneously, or allowed to close by the pressure of the water when not obstructed by foreign obstacles, in the manner and for the purpose set forth."

8. For an *Improvement in the Preparation of Vegetable Fibres;* David A. Wells, Cambridge, Massachusetts.

Claim.—"I do not claim, broadly, subjecting vegetable substances to the action of acids, as this has been done before for other purposes, and under essentially different proportions and circumstances, and with a different view; and therefore I do not wish to be understood as claiming, broadly, subjecting vegetable substances to the action of acids, except when used for the purpose of removing bases which would entirely, or for too long a time, resist the chemical action of the other branches of the process employed to obtain cellulose. I am also aware that lignine has been separated from woody fibre by dissolving the cementing substances in alkalies, more or less caustic, as aids to subsequent mechanical operations for obtaining fibres; and I do not, therefore, claim simply subjecting vegetable substances to the action of caustic alkalies. I am also aware that vegetable substances, after being subjected to the action of caustic alkalies, have been treated with acids, but under different circumstances, and for a different object. Heretofore, this has been done for the purpose of removing any adhering alkali, and all other foreign matters, whilst, in my process, I use an acid of an entirely different strength, not for the purpose of removing any alkali remaining from the previous branch of the process, for this I previously wash out, and not for the purpose of removing any gummy or glutinous matter, for this

I previously remove by means of the caustic alkali. But I have found that the cellulose, treated with an acid of such a strength, and for such a length of time, is so altered that the subsequent bleaching, by the ordinary means, is greatly facilitated and cheapened; and therefore I do not claim, broadly, treating vegetable substances with acids, after they have been subjected to the action of caustic alkalies, irrespective of the circumstances and the purposes herein specified. 1st, Aware that acids have been used in the treatment of crude or unprepared vegetable fibres, chiefly for the purpose of breaking and mechanically separating the woody and gummy matters; I do not, therefore, claim any such process; but what I claim is, removing coloring and resinous matters, cleaned and dressed flax, hemp, and other equivalent textile and fibrous material designed to be spun, felted, &c., by means of weak acid of about 3° Baumé, in the manner as set forth. 2d, In combination with the above, I also claim the employment of caustic alkalies, as specified, to obtain cellulose from vegetable substances, for the manufacture of paper, and for other purposes, in combination with the use of alkaline earths, substantially as specified, to preserve or restore the caustic state of the alkalies, as set forth. And, finally, I claim, in combination with the process for the separation of cellulose from vegetable substances, subjecting the products thereof to the action of a solution of efflorescent salts, substantially as and for the purpose specified."

9. For an *Improvement in Cops for Sewing Machines;* W. H. Akins, Ithaca, N. York.

Claim.—"What I claim is, the use of a cop or bobbin, without spindle or spool, in combination with a shuttle, or what is equivalent thereunto, when the thread is drawn or fed out from the inside of the cop or bobbin, by which means I secure an uniform tightness or tension on the cop or bobbin thread, as it is drawn or fed out from the shuttle, as described."

10. For *Improvements in Water Wheels;* Lorenzo D. Goodwin, Perueville, N. Y.

Claim.—"What I claim is, 1st, The form and proportions of the buckets, as specifically set forth, commencing in a true circle at a tangent to the outer periphery, and terminating in a straight line fifteen degrees in length at the inner curve, and at a tangent thereto, as explained. Also, the self-regulating gate to the scroll, constructed and arranged in the manner set forth."

11. For an *Improvement in Candle Mould Apparatus;* Willis Hurniston, Troy, N. Y.

Claim.—"What I claim is, 1st, The wick stretcher, so arranged that the wicks may be uniformly stretched before the material is run into the moulds, and the friction or strain be removed therefrom before the candles are drawn from the moulds, to prevent the breaking of the wicks, substantially as described. Also, in combination with the wick stretcher, the centering bar or plate, with its stop or guide, for first properly centering the wick at the top of the mould before it is stretched and held, substantially as described."

12. For an *Improvement in Bedstead Fastenings;* Eastman R. Ball, Kalamazoo, Mich.

Claim.—"What I claim is, fastening the rails to the posts of a bedstead, by means of the combined sustaining brackets and conical fastening pins, secured to the posts, and the conical holes in the under sides of the rails, arranged and operating with each other, substantially as set forth."

13. For an *Improvement in Machines for Corrugating Sheet Metal;* Solomon G. Booth, City of New York.

Claim.—"What I claim is, the construction and arrangement of the dies, so as to adjust them to any depth of corrugation and thickness of metal, by having the pieces separate from the parts, so that they, as well as the cam shaft, can be raised and lowered to make a deeper or shallower corrugation, the whole being combined and arranged substantially as set forth."

14. For an *Improved Valve Cock;* Benjamin Eakins, Philadelphia, Pa.

Claim.—"What I claim is, the peculiar construction of the valve, with the manner of opening and closing the same, as described."

15. For an *Improvement in Amalgamating Gold and Silver;* A. K. Eaton, City of N. Y.

Claim.—"What I claim is, the employment of an alloy of mercury and zinc, instead of pure mercury, in the process of amalgamating precious metals, substantially as set forth."

16. For an *Improvement in Railroad Frog Guards;* H. W. Farley, East Boston, Mass.

Claim.—"What I claim is, the supporting of the track rail opposite the frog, on the projecting base of the frog-guard, as set forth, so that without the intervention of bolts or other fastenings liable to become loose or deranged, the guard is held down by the track rails; but I make no claim to supporting the frog-guard and adjacent track rails in a common chair, as this is neither new nor capable of affording the security against accidents which my invention affords."

17. For an *Improvement in Cranberry Winnowers;* Phanuel Flanders, Lowell, Mass.

Claim.—"What I claim is, the cleaner and the arms, or their equivalents, in substance, and the separator, when the same is made and operated substantially as set forth."

18. For an *Improvement in Machines for Making Friction Matches;* Wm. Gates, Jr., Frankfort, and H. J. Harwood, Utica, N. Y.

Claim.—"What we claim is, 1st, The employment or use of the endless chain, formed of a series of clamps, constructed and arranged substantially as shown, for the purpose of receiving the match sticks for the cutting tool, and conveying them to the sulphur and igniting compounds with which their lower ends are covered, as shown and described. 2d, The peculiar form of the cutting tool, as described, viz: said tool being formed of a series of circular cutters, connected by semi-circular cutters, by which form the match sticks are placed in the clamps of the chain, at a sufficient distance apart to prevent their lower ends from being cemented together when immersed in the sulphur, and covered with the igniting compound; said tool, also, by being constructed as described, cutting the match sticks smoothly and easily from the block. 3d, Opening or parting the clamps of the chain at the proper time, or when each clamp is directly over the cutting tool, by means of the wedge, operated by the cam, or its equivalent, for the purpose of allowing the match sticks to enter the clamps as the cutting tool ascends to the top of the block, as described."

19. For an *Improvement in Treating Vulcanizable Gums;* Charles Goodyear, New Haven, Connecticut.

Claim.—"What I claim is, the method of manufacturing compounds of caoutchouc, gutta percha, and other gums susceptible of vulcanization, in sheets, by covering the surface or surfaces of the sheets of gum with sheets of paper or cloth, or the equivalent thereof, and then confining the same during the process of vulcanization, by pressure between plates of metal, or their equivalents, or otherwise, substantially as described."

20. For an *Improved Machine for Cutting Veneers;* Carmi Hart, Bridgeport, Conn.

Claim.—"What I claim is, 1st, Cutting veneers, or other thin stuff, by giving to the shaving knife a rectilinear movement towards and through the log at the same time that a rectilinear movement is given to the log either transversely or diagonally to the movement of the knife, so as to produce a long continuous drawing cut, as described, whether the said movements of the knife and log are produced by the precise arrangement of mechanical means described, or any other substantially the same. 2d, Making the ways, upon which the log carriage moves, adjustable, as described, relatively to the ways in which the knife and cutting table move, for the purpose of giving more or less of a drawing action to the cut, as the nature of the stuff to be operated upon may require. 3d, Attaching all the necessary appendages for holding the log and feeding it to the knife to a turn-table, capable of being adjusted circularly within the main frame or part of the log carriage, as described, for the purpose of presenting the grain of the stuff at any desired angle to the edge of the knife or direction of the cut. 4th, Suspending the log or block above the knife, by griping it with clamps, which form part of a suspending head, which supports the weight of said log or block, and prevents it dragging over the edge of the knife during the backward movement of the latter, and only allows it to be lowered under the control of suitable feeding mechanism. 5th, Setting the lever handle, which holds the clamps upon the log, free from the notched bar, by which it is secured for that purpose by means of the bar and the inclined block, of which the former is attached to the suspending head, and the latter to some fixed point on the turn-table of the log carriage, and the former is made to slide, by coming at a proper time in contact with the latter, in such a way as to raise the lever-handle, as described. 6th, Making the slots in the clamps which receive the bar and screw, of such length that after the clamps are arrested by coming in contact with the proper part of the log carriage or turn-table, the motion of the follower and the other parts of the feed motion may continue till it is desirable to stop

them, as described. 7th, The mechanism described, for rendering the pawl of the feed motion inoperative, and thereby stopping the descent of the suspending head and the feed of the log at the proper time, to wit: the bar, pin, spring, rod, arm, shaft, feather, and angle piece, the whole being combined and applied substantially as herein set forth."

21. For a *Combined Table and Chair;* Stephen Hedges, City of New York.

Claim.—"What I claim is, the manner described, of rendering a table of ordinary construction susceptible of being combined with a chair, and of being used as a smaller stand or writing desk and chair combined, by constructing the table in two sections, and jointing said sections together, one of which forms a chair with a flap or removable top, and the other a stand, smaller table, or writing desk, with a stationary top, having the flap of the chair hinged to it, one end of each section being jointed together by a hinge, upon which the chair turns when it is desired to use the table as a stand or writing desk and chair combined, or after it has been used as such, substantially as described."

22. For an *Improvement in Treating Caoutchouc and other Vulcanizable Gums;* L. Otto P. Meyer, Newtown, Connecticut.

Claim.—"I do not claim interposing between sheets of gum, &c., to be cured, sheets of flexible material, when the series of sheets thus piled are confined between plates of iron during the process of vulcanization, as this makes no part of my invention, which consists in covering the surface of what is known as the hard compound of caoutchouc with tin foil, or other equivalent substance, to preserve the form previously given by embossing or moulding, the contact of the tin foil during the curing process having the effect, as I have discovered, to preserve the form and the surface, without pressure or moulds. What I claim is, the use of tin foil, or the equivalent thereof, for the purpose of preserving, during the process of heating, the forms or shapes given to the hard compounds of vulcanized caoutchouc, and other vulcanizable gums, substantially as described."

23. For an *Improvement in Enema Syringes;* Morris Mattson, Boston, Mass.

Claim.—"What I claim is, 1st, The combination of the thumb or finger rest with the barrel and piston, and for the purpose essentially as specified. 2d, The upper ring valve seat, and the perforated tube, in combination with the disk or valve, and its seat and chamber, the same being made to operate substantially as described."

24. For an *Improvement in Machines for Making Wire Netting;* Jno. Nesmith, Lowell, Massachusetts.

Claim.—"It being understood that the take-up motion acts or operates at the right time, so as to keep the wire straight and smooth during the operation of the said machine, as set forth, what I claim is, 1st, Revolving the wires, by the means substantially as described, for the purpose of keeping them parallel to each other, so that they cannot get entangled with each other during the process of making the netting or fencing. 2d, Vibrating the wires alternately from the left to the right, or the right to the left, before or after, or at the same time of twisting them the said wires together, by means of the cams and the shippers, and connected to the said cams by levers. 3d, The jaws or clamps, or the same in substance, for the purpose of drawing the wire through the machine at the required times by means of the cams and levers, operating the same essentially as laid down in the within specification and drawings. 4th, The two planes and their mechanical equivalents, with the cams and levers for operating the same, substantially and for the purposes set forth. 5th, The wire reels and movable reel stands, with the friction springs for the reels and holes through either end of the said reel stands, for admitting, protecting, and guiding the wire, or the mechanical equivalents of the said reels and reel stands. 6th, The feeding and twisting gears, with or without their centres perforated to admit the border or warp wires passing through the same, and the said gears having slots cut in them for the receiving and sliding of the ends of the stands and wires in the same, substantially as set forth."

25. For an *Improvement in Drills for Metal Drilling;* Abiel Pease, Enfield, Conn.

Claim.—"I am aware that drills have been used with a hole in the centre, extending lengthways of the drill, but such I do not claim; but what I claim is, constructing a drill for drilling metals, with a notch, with two cutting edges, which leave a guiding cone in the centre of the hole as it is bored, which is cut down as the drill advances, in combination with the beveled edges of the lips, substantially as set forth."

26. For an *Improvement in Training Posts;* Joseph Sollenberger, Higginsport, Ohio.

Claim.—"I do not claim a post, in itself, nor a wire hook, in itself; but what I do claim is, a training post, composed of a staff and hooks at proper intervals on the staff, for the purpose of rapidly treating and dressing vines, in the manner described, and at the proper season, the staff and hooks being prepared and located all ready for instant action when the season for vine dressing arrives, the whole being combined and used substantially in the manner and for the purpose described."

27. For *Improvements in Pumps;* Joseph Edson, Boston, Massachusetts.

Claim.—"What I claim is, the cap, with its valve, constructed and arranged in the manner substantially as described. The cap being cut away upon one side for the accommodation of the valve, and packed at the points, to prevent the return of the water from the passage to the cylinder, the valve being made to bear immediately upon the upper end of the cylinder, by which construction and arrangement of parts I am enabled to force out from the cylinder each time the valve is raised, any air which may have collected above the piston, and thus effectually avoid the air cushion above the piston."

28. For *Improvements in Heating Skelps for the Manufacture of Wrought Iron Tubes;* James McCarty, Reading, Pennsylvania.

Claim.—"What I claim is, the new method of operating, as described, viz: heating the skelps in a furnace constructed substantially as set forth, with raw coal as fuel, whose combustion is maintained by a blast of air forced into the furnace under pressure, as set forth."

29. For an *Improved Bit Fastening for Cast Iron Bench Planes;* Wm. S. Loughborough, Victor, N. York.

Claim.—"What I claim is, 1st, The combination of the adjustable lever cap with the screw by which it is operated. 2d, The manner of connecting the said adjustable lever cap with the stock of the plane, as described."

30. For an *Improved Machine for Crozing the Ends of Staves;* Geo. W. Livermore, Cambridgeport, Massachusetts; patented in England, Aug. 31, 1853.

Claim.—"What I claim is, the combination of the carrying drums, the pressure bars, and the revolving cutters, with the hopper, for the purpose of delivering the staves, one by one, to the cutters; the hopper being constructed as represented, to permit the escape of the stave on one side, and not on the other."

31. For an *Improvement in a Machine for Drying Tobacco;* T. Lafetra, City of N. Y.

Claim.—"What I claim is, the drying tobacco by forcing currents of air through it, in combination with the confining thereof, by means of the chambers or cells formed and constructed as described, or by any other mode that is substantially the same and will produce the same result."

32. For *Improvements in Making Railroad Chairs;* John C. Ogden, Assignor to Chas. S. Ogden Philadelphia, Pa.

Claim.—"I do not claim the chairs described and illustrated, nor any other particular form of chairs for railroad rails; nor do I claim operating the punches and dies by means of cam rollers; but what I do claim is, making chairs for railroad rails by passing the 'hot mill bars direct from bar rolls out of which the chairs are to be made,' without reheating, 'and by the same working hands usual at roll train between a pair of rolls, constructed and operating on the principle substantially as described, and the punches and dies for punching and forming the chairs being secured around the peripheries of said rolls, substantially as described."

APRIL 11.

33. For an *Improved Coffee Pot;* James McGregor, Jr., Troy, New York.

"The nature of my improvements consists in surrounding the bottom (or bottom and sides as far as may be desired) of tea or coffee pots with an outer case, which may or may not be attached to the tea or coffee pot, leaving a space for water between the inner and outer case, of sufficient capacity to prevent evaporation from reducing the water between the two cases below the bottom of the tea or coffee pot, while the tea or coffee is being prepared, &c. There is no loss from evaporation, none being allowed; the coffee or tea may be steeped some time longer to advantage than in the former mode. 2d, In having

a mouth-piece to the outer case for the purpose of pouring water, or other fluid, between the two cases; while the pot is on the heating apparatus, this mouth-piece is always to be kept open. When it is removed from the heating apparatus, this mouth-piece may be covered to retain heat."

Claim.—"Having the pot, where the tea or coffee is prepared, air-tight, and so regulating the heat that is applied to the heating of the same, that a small pressure by the covers prevents it from boiling, and consequently from evaporation, while the tea or coffee is being prepared, in the manner set forth."

34. For an *Improvement in Seed Planters;* Elbridge Marshall, Clinton, N. J.

"The nature of the invention consists, 1st, In operating the distributing device by means of two cams, having two sets or rows of inclined planes placed on concentric circles, for the purpose of causing one of the cams to be operated evenly, in a direction always perfectly longitudinal with the shaft on which it is placed, and thereby preventing any unnecessary friction or binding of said cam upon its shaft. The cam above-mentioned is connected with gearing, by which, upon applying the hand to a crank, the gearing will be operated and said cam turned on the shaft so as to cause the seed to be dropped at greater intervals. 2d, In a peculiar arrangement of the distributing device, by which the seed is dropped with certainty at the proper times, and the apertures in the bottoms of the hoppers and plates prevented from being clogged or choked with the seed."

Claim.—"I do not claim the rotating hoppers with perforated bottoms; neither do I claim any peculiarity in the furrow and covering shares, nor the movable frames to which they are attached, nor the cams, irrespective of their peculiar construction; but what I claim is, 1st, The cams, having two rows or sets of inclined planes upon their faces, said inclined planes being placed oppositely on concentric circles, for the purpose of creating an equal pressure upon the cam, and connecting said cam with suitable gearing, substantially as shown, whereby its position upon the shaft may be changed, and the seed dropped at a greater or less distance apart, whenever the crank is operated or turned by the hand. 2d, The bar, performing, in combination with the circular plates underneath the hoppers, the office of a valve, simultaneously rotating said hoppers by its vibrating motion; the above parts being arranged and operating substantially as described."

35. For an *Improvement in Mills for Grinding Ores, &c.;* W. Ball, Chicopee, Mass.

Claim.—"I am aware that crushing machines have been made, similar in some respects to mine, viz: in the use of balls made to revolve by means of a flat plate or disk, loaded so as to give crushing force to the balls, and to these devices I lay no claim; but I regard my invention and improvement as consisting chiefly in the manner in which I apply pressure to the balls, and the advantages resulting therefrom, and therefore I claim, 1st, The mode described, of applying pressure to the balls, that is to say, making the pressure diagonally or obliquely to the line or axis of the pressing shaft, or obliquely to the vertical diameter of the balls, as a distinct feature from that which is known as the turn-table machine, where the pressure is on the top of the balls, this oblique pressure being effected by the curved central driver, or its equivalent. 2d, The rocking step, in combination with the oblique pressure upon the balls, in the manner set forth. 3d, Making such screen with a conical head, having the lower or conical surface the screening part, for the purpose specified."

36. For an *Improvement in Seed Planters;* Thomas Carter, Laurens District, S. C.

Claim.—"What I claim is, the seed discharging apparatus, in the periphery of the seed wheel, the tube, or apparatus, the escapement wires, and the protecting spring valves, in the manner described."

37. For an *Improvement in Iron Buildings;* Stephen Colwell, Philadelphia, Penna.

Claim.—"What I claim is, the mode of constructing the skeleton walls of buildings of any desired thickness, by placing vertically upon each other, rectangular frames, or hollow squares of cast iron, and sections of the same, like bricks or blocks of stone, but not breaking joints, as in laying brick or stone, the said frames being connected together and leveled, substantially as described, the skeleton wall being separate from the covering of the building, but adapted for receiving on its exterior or interior surface, a covering of plates of iron, or other suitable material, removable at will."

38. For an *Improvement in Sewing Machines;* Samuel J. Parker, Ithaca, N. Y.

Claim.—"What I claim is, that combination that secures to me the relative position in which I place the needle's eye to the movement of the material or feed motion, and the

position of the shuttle and its race resulting therefrom, when the needle is straight and the table on which the material is to be sewn, is horizontal, said relative position meaning the longitudinal axis of the shuttle and its race, at right angles to the feed motion, and the consequent position of the needle's eye therefrom, so that a line drawn through the needle's eye when in the act of passing the centre of the material sewn, shall coincide with the line of feed motion, not be at right angles therewith, and this for the purpose of rendering the stitch more nearly straight and perfect than it otherwise would be, the combination and purpose substantially as described."

39. For an *Improvement in Rat Traps;* Hiram Stafford, Mount Pulaski, Illinois.

"The nature of my invention consists in constructing a rat trap which is provided with a tilting-board, which acts in combination with swinging arms or bars, which constitute the barrier to prevent his escape, and which are acted upon by the animal as he rests his foot on the tilting-board, and causes them to be swung round until they intersect at their points, and thereby prevent his escape in the most effectual manner."

Claim.—"What I claim is, the combination of the tilting-board with the swinging forks and their apparatus, precisely as shown, and for the purpose and in the manner substantially as described."

40. For an *Improvement in Brick Machines;* Thomas E. Seay, Columbia, Virginia.

"My invention consists in the employment of a system of knives, arranged and movable vertically, by a combination of levers and springs, so as to cut the body of the clay from that contained in the moulds; said moulds, and the bricks within them, being at the same time delivered at the top of the machine by the levers operating the knives; the invention also consists in the employment of a grating in the hopper leading to the moulds, by which the clay is screened of stones, and other foreign substances, before being forced into the moulds."

Claim.—"What I claim is, the vertically moving knives, arranged as described, in combination with the levers and slides, whereby the moulded bricks are separated from the mass of clay at the same time that the moulds are raised from their recess, for carrying away and discharging the bricks. Also, the employment of the gratings, as described, between the mill and moulds, for screening the clay from stones and other hard substances, when this is combined with the exterior chamber, into which the stones and other substances are forced by the action of the clay."

41. For an *Improvement in Street Gas Lamps;* William A. Shaw and George Parker, Boston, Massachusetts.

Claim.—"What we claim as a substitute for the stop cock to stop the passage of the gas is, the cap, lined with vulcanized rubber, or other proper material, which cap fits air-tight over the mouth of the burner, as set forth."

42. For an *Improvement in Fish Hooks;* Henry Sigler, Houston, Texas.

Claim.—"What I claim is, making the top portion of the hooks elastic, and so attaching them to the vertical guide piece that they will be made to act as springs for giving action to the hooks, and forcing them together, and also serve with the arms to form a toggle-joint for forcing said hooks apart, and retaining them set for a given time, and in combination with the employing a common bait hook, which is attached to the lower end of the regulating slide, and so situated that its end will be some distance above the ends of the spring-hook, and consequently the fish or animal will have to pass his head between the spring hooks to reach the bait, and in drawing upon which, he will draw the toggle arms out of a horizontal position, and simultaneous therewith operate the spring hooks, which, by there elasticity, are caused to take into the body of the fish and hold it perfectly secure, there being no chance of his escaping, owing to the peculiar action of the hook, it biting harder upon its object when the strain is greatest, substantially as described."

43. For an *Improvement in Machines for Cleaning Cotton;* Charles Leavitt, Quincy, Illinois, Assignor to Sterling R. Cockrill, Nashville, Tennessee.

Claim.—"What I claim is, arranging the several parts involved in extracting the motes, dust, and other impurities, from cotton, previous to and preparatory for ginning the same, substantially in the manner described; that is, combining a wire screen concave, with a revolving wire screen cylinder, or their equivalents, and a wind wheel or fan revolving within the cylinder, both cylinder and concave being armed with teeth set in ribs so distant apart with regard to the teeth as to permit the cotton seed to pass, while the fibre

alone is loosened, the revolving screen running slowly in comparison with the wind wheel, which is driven at a great velocity, thereby adapting the machine to the particular purpose specified, viz: freeing cotton from motes, dust, and other impurities, while attached to the seed, previous to ginning the same."

44. For an *Improvement in Sewing Machines;* James Harrison, Jr., Milwaukie, Wis.

Claim.—"What I claim is, 1st, The combination of the spring, the roller, and the screw, or adjustable pin, operating in the manner described, to prevent the delivery of the needle thread for the successive stitches, until each preceding stitch is drawn to the desired degree of tightness, and then to cause sufficient to be given out for the next stitch, thus regulating the tightness of that part of the stitch formed by the needle thread. 2d, The combination of the drag bar, attached to the shuttle, and containing the eye through which the thread passes therefrom, the spring for throwing the said bar into a position to prevent the delivery of thread from the shuttle, and the adjustable liberating piece, operating as described, for the purpose of preventing the delivery of thread from the shuttle, until after each stitch is finished, and then allowing only the quantity desired to be given out, whereby the tightness of that part of the stitch formed by the shuttle thread, is perfectly regulated. 3d, Constructing the shuttle in two parts, viz: the shell and cap, of which the latter is inserted into and withdrawn from the former, endwise, as described."

45. For an *Improvement in Rat Traps;* Jose Foll, Locust Grove, Ohio.

Claim.—"What I claim is, the combination, as described, of reciprocating and self-locking partitions and floor, in connexion with the weighted crank, which, on the liberation of the catch, alternately opens and closes the entrances of the chambers and of the cell."

46. For an *Improvement in Trusses for Iron Bridges;* George W. Thayer, Springfield, Massachusetts.

Claim.—"What I claim is, the combining or arranging together a series of interlocking and overlapping metallic arched beams, a series of vertical suspension tie bolts, extending from the lower chords to the crowns of the arches of the metallic arched beams, and a series of struts or tie-bolts, extending from the lower to the upper set of chords, the whole, when combined and arranged substantially as set forth, constituting a truss having great strength and advantages, as stated, and made with one long arched beam to extend over and embrace two or more of the arches."

47. For an *Improvement in Reversible Life-Boats;* Nathan Thompson, Jr., Williamsburgh, New York.

"The nature of the first part of my invention consists in an extensible bottom, constructed and applied to a life-boat, substantially in the manner described. And the second part consists in bracing said bottom in such a manner that it will, when in use, apply itself vertically under the cavity of the boat to which it is attached."

Claim.—"I intend to use any known kind of life-boat, provided its bottom be taken out, and then, when my bottom is applied thereto, it will constitute my invention; I do not claim, as of my own invention, a boat whose bottom is secured near the middle of its height or depth, nor one whose bottom slides up and down from the lower to the upper edge of the sides, and vice versa; neither do I limit myself to the use of any special materials in constructing my extensible bottom, or bracing thereto; but I do claim, 1st, The extensible bottom, which may be stowed within the boat, or when in use drop below either side of it, constructed and applied to a life-boat, substantially in the manner and for the purposes described. 2d, I claim, in combination with such an extensible bottom, the diagonal bracing cords, applied in the manner and for the purposes substantially as described."

48. For an *Improved Lubricator;* John Webster, City of New York.

"The nature of my invention consists in the arrangement of having the steam act on the top of the oil as well as below the oil, by which means the oil is not obstructed in its passage by the steam."

Claim.—"What I claim is, The combination of the divided chamber with a three-way cock, one position of which admits oil to the chamber, but shuts off the steam; the other position shuts off the oil and allows the steam to pass from one partition of said chamber to the upper surface of the oil in the other, for the purpose substantially specified."

49. For an *Improved Boring and Mortising Machine;* Henry Allen, Norwich, Conn.

Claim.—"What I claim is, the two adjustable stops, or their equivalents, applied to the

frame or ways that support the feeding carriage, and made to operate in any one of the mortise recesses thereof, the said stops being not only for regulating the amount of movement of the feeding carriage required while a mortise is being made by the boring tool, but also to compensate for the wear of the tool, as stated. Also, the adjustable shifting catch, in combination with the adjustable gauge or slide plate, provided with a recess and screw, as specified, the same being particularly for the purpose of readily centralizing the boring tool, as stated."

50. For a *Combination of Foot Stoves and Lanterns;* F. Arnold, Haddam, Conn.

"The nature of my invention consists in the peculiar method of combining, for many practical purposes, a lamp heating foot stove and a lantern, constructed in such a manner that it will answer the purpose of a foot stove, or a lantern, and convenient for heating any article placed upon its top, for cooking and other purposes."

Claim.—"What I claim is, the movable grate attached to the handle, in combination with the foot stove and lantern, constructed substantially as described."

51. For an *Improved Iron Frame Upright Piano Forte;* Stephen P. Brooks, Boston, Massachusetts.

"The object of my invention is, to improve the tone of the piano by arranging the strings upon an iron frame, with the sounding board directly attached to said frame, without the use of a wooden bed or frame, as heretofore used, or of any other substance between the sounding board and the iron frame, thereby diminishing the cost of the construction of the piano, and also to improve the tone of the upright piano by giving the blow of the hammer upon the strings in a direction from the sounding board, instead of towards it, as heretofore done, and at the same time so to simplify and arrange the action in an upright piano, as to bring it level with, or below the keys, so as to avoid the necessity of casing the top, thereby very materially lessening the expense of the instrument."

Claim.—"What I claim is, an upright piano, in which the iron frame that receives the strings, is curved or arched, so as to prevent the breaking or springing of the said frame by the strain of the strings, and so arranging said iron frame as to make it serve for legs, and the support of the main parts of the instrument, as set forth. Also, placing the whole of the action level with, or below the line of the keys, so as to avoid the necessity of casing the top of the piano, as above set forth. Also, giving the blow to the hammer, and then holding it after the blow is struck by means of the triangular piece and its notch, operating with the rod, substantially as described, and so arranging the action in an upright piano, as to give the blow upon the strings in a direction from the sounding board, as specified."

52. For an *Improved Attachment for Fish Hooks and Artificial Baits;* Julio T. Bull, Whitehall, New York.

Claim.—"What I claim is, 1st, Preventing the points of fish hooks catching in snags and weeds, while trolling, by means of a spring which is attached loosely to a hook or artificial bait, and provided with a stay or support to rest or bear upon whilst sprung against the inner side of the point of the hook. The said spring, by reason of its elasticity, remaining in connexion with the point of the hook, until it is struck by a fish, when it disconnects itself from the point of the same, and allows it to perform its duty, substantially as described. 2d, Arranging a spring catch on the concave side of an artificial bait, for retaining the said protecting spring in its place, and out of the way when not in use, substantially as described. 3d, Providing the lower extremity of artificial baits with a tube which terminates in an eye, so that they may be used with a single or double hook, and with or without the spring protection; the tube serving for the shank of a single hook to be secured in, and the eye for a double hook, substantially as described."

53. For an *Improvement in Dressing Flax and Hemp;* Lewis S. Chichester, Brooklyn, New York.

Claim.—"What I claim is, the combination of the series of twisted or spiral and conical shaped blades on the two rotating stocks, substantially as specified, which, by reason of the twist and conical shape, perform a beating action on the fibres at one end, and gradually change until they perform a scutching action at the other end, as set forth. And I also claim, in combination with the rotating and twisted and conical-shaped blades, the casing which surrounds them and the discharge pipe at one end, to confine and direct the

current of air which is induced, by the rotation of the twisted blades, towards the discharge spout, substantially as and for the purpose specified."

54. For an *Improved Swell Mute Attachment to Piano Fortes;* A. G. Corliss, Portland, Maine.

"The nature of my invention consists in the employment of clamps, so arranged within the instruments, and so controlled by suitable mechanism, that the performer may, at pleasure, cause them to press upon both sides of the bridge and hold it in such a manner as to control the vibration of the sounding board, and thus regulate the tone."

Claim.—"What I claim is, controlling the vibration of the sounding board by means of what I have termed the 'mutes,' which are so arranged and actuated as to be capable, when desired, of pressing upon the bridge with any degree of force necessary to produce the tone desired, as described."

55. For an *Improvement in Door Hinges;* John Elgar, Baltimore, Maryland.

"The effect of this invention is such that when a door, after being opened to the ordinary angle, begins to close, it will receive an impulse that starts it quickly, and then it will be checked and move more gently on the easy part of the descent, until when nearly closed, the steepest or most abrupt part of the inclined joint will come into operation, and bring the door up close shut."

Claim.—"What I claim is, making the joint of door or gate hinges, a series of varied inclined planes or curves, which accelerate and retard, as described, the movement of the door or gate, in closing by its own weight."

56. For an *Improvement in Earth Cars;* Richard H. Emerson, Chicago, Illinois.

Claim.—"I do not claim the invention of a car with hinged or turning flaps in the bottom for discharging earth or other materials; nor do I claim raising or lowering such doors or flaps, by means of a windlass and chains, or of securing them and working them by means of crank shafts and catches; nor do I claim as new, the attachment of a bevel-plate or scraper to a carriage, for the purpose of spreading the earth dropped from the cars, as these devices have all been used before; but what I do claim is, the construction of a long car, arranged as described, with two sets of doors in the bottom, of different breadths, which, in combination with the chains, axles, and crank shafts, and the attached leveling plate, enables me to discharge and spread nearly one-half of the load, without discharging the whole, and to equalize the quantities of earth dropped by disengaging the different sets of doors, which could not be done if the doors were of equal width, and only one-half of them dropped at one time."

57. For an *Improvement in Piano Forte Actions;* Alexander Hall, Lloydsville, Ohio.

"The nature of my invention consists in a peculiar arrangement of the strings, bridges, and action of the piano forte, by which I am enabled to introduce the upper octaves in addition to the normal notes, while playing upon the instrument."

Claim.—"What I claim is, 1st, The arrangement of the bridges of the upper octave strings, in combination with the shifting action, so that the nodal points of these strings may coincide with those of the normal strings, in the manner set forth. 2d, The mode of shifting the action by pivoting the key-board, in combination with the employment of upper octave strings, in the manner set forth. 3d, Making the hammer heads of hard and soft material, for the purpose of playing with effect upon the upper octave and normal strings with the same hammer head."

APRIL 18.

58. For an *Improvement in Brick Machines;* Stephen Ustick, Philadelphia, Pennsylvania; ante-dated November 15, 1853.

"The nature of my invention consists in the employment of a combination of movable and fixed pistons, and movable mould boxes, arranged and operating as described, together with an arrangement for receiving and delivering the moulded brick, and also a combination of devices for lubricating the faces of the pistons after the delivery of each brick, for preventing the adhesion of the clay to said pistons."

Claim.—"I do not claim, in general, the combination of the reciprocating mould boxes, with the stationary and movable pistons; nor do I claim merely feeding the clay through the side of the mould box at right angles to the line of motion of the piston, as these features exist in other machines; but what I do claim is, 1st, The arrangement, substan-

tially as described, of the mould box, with the fixed and movable pistons, whereby, by its motion in the line of motion of the piston, it is made to perform the function of feeding the clay between the pistons, shutting it off from communication with the hopper, and discharging the brick. 2d, The apparatus for receiving and delivering the brick, consisting of the hand, table, and finger, arranged and operating substantially as described. 3d, The arranging on the cam wheel, the oil boxes for lubricating and cleaning the faces of the pistons. 4th, The withdrawing the condensed air from the mould while the pressure is produced by the groove and scraper, or other equivalent devices, substantially as set forth."

59. For an *Improved Circular Sawing Machine;* Stephen Waterman, Williamsburgh, New York.

Claim.—"I do not claim hanging the shaft of a circular saw in a swinging frame moving around a stationary axis; but what I claim is, 1st, Raising the saw shaft by any mechanical means analogous to those described, to bring the collar and nut, or other device by which the saw is secured thereto, to a fixed position above the level of the plane of the top of the carriage, and close under the unsquared portion of the log during the cutting of the slabs from the log, so that the slabs may be cut from a much larger log than when the saw shaft, or the collar and nut, or other device for securing the saw thereto, remains below the level of the plane of the top of the carriage. 2d, Controlling the tension of the driving belt, so that it shall be tight when the saw shaft is in position for cutting, either above or below the log, but slack at other times, by means of the three guide rollers, of which the first two are hung on axis, in arms secured firmly to the rock shaft, and the latter is hung on an axis, in swinging arms, which are held in proper position when the belt is tight, by contact with fixed arms on the shaft, the whole operating as set forth. 3d, A dog, of the lever form described, attached below each or any of the slides by which the log is moved laterally, so that its tooth will project beyond the face of the said slide and under the log, and controlled by a screw through the slide, by which its tooth may be forced upwards into the log when desired, as described."

60. For an *Improvement in Tailors' Measures;* M. T. Rowlands, Pittston Ferry, Pa.

Claim.—"What I claim is, the front, side, and back scales, or their equivalents, constructed and used in conjunction, for the purpose of taking the measures of persons, and cutting garments to fit them, substantially as described."

61. For an *Improvement in Machines for Bleaching Flax;* J. A. Roth and J. Lee, Philadelphia, Pa.

Claim.—"What we claim is, 1st, The employment of a series of combs, for the purpose of sustaining the fibres, constructed and arranged in the manner substantially as described. 2d, The flax or yarn frame, and method of arranging the combs in combination therewith, substantially as described. 3d, The combination of flax or yarn frame and vat, substantially as described."

62. For an *Improvement in Iron Fences;* Matthias P. Coons, Brooklyn, N. Y.

Claim.—"I do not claim any particular device or construction of a post or straining pillar, nor any particular mode of attaching wire or rods to them; but I claim combining a spring bar with the rails, wires, or their equivalents, of metallic fence, in the manner substatially set forth, for the purpose of yielding to pressure or strain arising from change of temperature."

63. For an *Improvement in Machines for Winding and Folding Cloth;* Thomas P. Forsyth, Dalton, Indiana.

Claim.—"What I claim is, the use of the stretcher, in combination with the adjustable guides and slides, and the winding shaft, or the bits, as the case may be, substantially in the manner described."

64. For an *Improved Turning Lathe;* Garret Meldrum, West Philadelphia, Pa.

Claim.—"I do not claim, the mechanical arrangements or combinations for sustaining and communicating a revolution to the machine, as these are common to all lathes; nor do I claim or prescribe any particular kind of tool rest, or cutter, as these are also common; but what I claim is, 1st, The chucks and pinions, with their mandrels passing through the bosses in the chuck plate, in combination with the central spur wheel, substantially as described. 2d, The pawls and their ratchet notches, in combination with the

chucks, substantially as described. 3d, The screw bolt, in combination with the concentric slot in the centre wheel, and the indicator, with the regular divisions, or their equivalents, marked on the wheel, substantially as described; and, 4th, The adjustable tail rest plate, having bosses to correspond with the corresponding bosses in the chuck plate, in combination with the screw mandrels and their jaw nuts, the said tail rest plate being adjustable on the main shaft, substantially as described."

65. For an *Improvement in Spiral Springs for Railroad Cars;* Fowler M. Ray, City of New York.

Claim.—"I am aware that flat, volute, or coiled springs have been applied to carriages, with the weight or force acting in the direction of the volute or coil, the centre of the spring being connected with the running gear and the body of the carriage suspended to the outer end of the coil; from which it follows that the lateral thrusts of the carriage must act incidentally on the spring in or nearly in a line parallel with the axes of the spring; but in such mode of application, the force in that line being merely incidental, the spring is not and cannot be coiled and confined close in a surrounding case, for the play of the spring, being in the direction of the entire freedom between the several coils, is indispensable, and hence the several coils do not mutually support each other, as under my mode of application, in which the coils are in contact, or nearly so, with each other, and thus held by a surrounding or confining case; I do not, therefore, claim the application of force to a flat volute or coiled spring, irrespective of the manner in which the coil is made and confined, so that the several coils shall support each other, on the principle specified. What I claim is, the employment of a flat volute or coiled spring with the outer coil supported by the outer case, substantially as specified, when this is combined with the application of the weight or force to the inner and outer coils, in lines parallel or nearly so with the axis of the spring. And, also, the employment of one or more conical surfaces, or the equivalents thereof, in combination with the coiled spring, substantially as specified, for the purpose of reducing the active length of the spring, as the weight or force applied is increased."

66. For an *Improvement in Machines for Paring Apples;* John D. Seagrave, Milford, Massachusetts.

Claim.—"I do not claim, in general, the device of combining with a paring machine, in which the paring knife moves automatically over the apple, a sliding piece moved automatically in regular alternation with the movements of the knife in such manner as to push the apple from the fork at the completion of the paring, because such device has been used before in the apple parer of Chas. P. Carter, patented Oct. 16, 1849; but what I do claim is, the specific mechanical arrangement for said device, viz: the sheath, made to slide upon the spindle or axis of the fork, and operated by the wire lever, which is impelled at the proper moment by the pin on the wheel."

67. For an *Improvement in Gas Regulators;* G. B. Dixwell, Boston, Mass., and J. A. Dorr, City of New York.

Claim.—"What we claim is, an improvement on the form of gas regulator described as Clegg's, and other similar gas regulators, by disconnecting from the regulating gasometer thereof the surface which is interposed between the main and the branch, and upon which the disturbing pressure of the gas in the main operates, and which, in those regulators, is connected with the regulating gasometer, and connecting the regulating gasometer with a tube, or its equivalent apparatus, which is not disturbed by the varying pressure of the gas in the main, in the manner substantially as described."

68. For an *Improvement in Car Couplings;* Geo. Aulick, Winchester, Va.

Claim.—"What I claim is, constructing a metallic box with vertical grooves, and an inclined trough or slide chamber, and using in combination therewith, a vertically operating valve-like catch, formed with a convex or oval side, and a bevel-like lip or projection, together with a gravitating or self-acting bolt or sliding latch, specifically as described."

69. For an *Improved Box Machine;* Ari Davis, Washington, D. C.

Claim.—"What I claim is, the corner, fastened in the manner described, by forming a mitre joint, and scoring the outside of the box, in the manner described, and fastening the two parts at the corner by the angles of metal, without the use of nails or screws; also, the combination of saws and cutters for forming the joint, as described."

70. For an *Improved Apparatus for Painting Window Blinds, &c.;* Samuel T. Field, Worcester, Massachusetts.

Claim.—"I do not confine myself to any particular devices for holding the blinds or other articles, as they may be varied to a considerable extent; but what I claim is, the mode of painting or otherwise coating blinds, or any other articles, by dipping them in a vessel containing the paint, or other material, and the giving them a revolving motion within a cylinder box or case, to throw off the superfluous paint or material, substantially as set forth."

71. For an *Improvement in Attaching Propellers to the Driving Shaft;* James L. Cathcart, Washington, D. C.

Claim.—"What I claim is, attaching the propeller, secured to a short shaft which passes through the rudder to its main or driving shaft, by an universal joint placed between the stern post and the rudder, by which attachment the propeller is moved laterally with the movement of the rudder."

72. For an *Improved Water Wheel;* G. M. Conner, Charlton, N. Y.

Claim.—"What I claim is, enlarging and contracting the vent or discharge orifice, so as to correspond to the inlet passage, by means of the ring formed of three sections, attached to each other, as shown, and connected to the crank arm of the gate by the lever, as set forth."

73. For a *Machine for Cleaning Blinds, &c.;* G. W. La Baw, Jersey City, N. J.

Claim.—"What I claim is, this machine as original, and the application of it for cleaning doors, blinds, shutters, and panel work generally."

74. For a *Method of Heating, Warming, and Cooking by Gas;* William Boggett and Geo. B. Pettit, Westminster, England; patented in England, Oct. 22, 1851.

Claim.—"What we claim is, making gas burners for heating and cooking purposes, with minute apertures from an inverted or inclined surface or surfaces, substantially as described, so that the upward current or currents of atmospheric air shall be made to impinge and act on the issuing gas at the point or points of issue, on the principle and for the purpose specified. Also, combining with burners constructed and operated on the principle specified, a chamber, through which the gas shall pass to supply the issues, and so located that the flame shall impinge against the surface thereof."

75. For an *Improved Landing Net for Anglers;* Chas. De Saxe, City of New York, Assignor to Thomas H. Bate, Brooklyn, New York.

"The nature of my invention consists in so making the hoop or mouth of the net with proper and convenient joints or hinges, that this hoop may be folded up in a small compass, and thus rendered much more convenient, and less cumbersome, while, at the same time, its strength is not diminished, nor its usefulness impaired."

Claim.—"What I claim is, the construction and arrangement of a landing net in one compact and connected mechanism attached to the staff, made substantially as described, or in an equivalent form, so that it can be folded up upon the staff, or expanded, at the pleasure or convenience of the user."

76. For an *Improvement in Fishing Rods and Floats;* Charles D. Saxe, City of N. Y., Assignor to Thomas H. Bate, Brooklyn, New York.

Claim.—"I am aware that fishing rods have been often constructed so that the different pieces or lengths should slide within each other, and I am also aware that these various pieces have been made of different lengths, the largest one being the longest, so that there would be a space in the largest not occupied by the other lengths; but so far as I have been able to learn, this space has never been rendered useful by converting it into a safe and convenient receptacle for carrying the various implements and contrivances belonging to the angler's art, such as hooks, hackles, leads, swivels, &c. I do not claim the peculiar construction of the rod; but I do claim the combination of the tackle safe with the rod, so that the whole combination forms but a single article, compact, safe, and convenient. Also, the peculiar construction of the float, by which the slightest touch at or interference with the hook causes the line to be suddenly moved or jerked, as if by a quick motion of the hand, and the fish to be thereby hooked, and whether the float is used with the combination set forth, or separately therefrom."

77. For an *Improvement in Potato Washing Machines;* J. H. Fairchild and Sylvanus Richardson, Jericho, Vermont.

Claim.—"What we claim is, the manner of constructing the machine with an outer solid revolving cylinder, for containing water and catching the dirt removed from the roots, and with an inner slatted cylinder, which is secured fast to the outer cylinder, and revolves with it, for removing the dirt and foreign matter from the roots, and discharging them in a clean state at one end of the machine, in combination with the spiral or screw thread, placed in a spiral manner between the two cylinders, for the purpose of separating the dirt from the washed roots, and effecting its discharge simultaneous with the discharge of the roots at the opposite end of the machine, through the passage."

78. For an *Improved Portable Ladder or Fire Escape;* Thomas Armitage, Philadelphia, Pennsylvania.

Claim.—"What I claim is, the mode described, of constructing an extension rescue or ladder, by means of a series of knee-shaped pieces, &c., and a series of rungs of unequal and graduated length, combined and operating in the manner substantially as described."

79. For an *Improved Oyster Knife;* Philos Blake, New Haven, Connecticut.

"My improvement consists in combining with the oyster knife, two parallel cheeks or lips, firmly secured to the shank near the heel of the blade, between which cheeks the nose or thin end of the oyster may be inserted, by a prying or twisting motion broken off, in order to present an opening for the entrance of the blades of the knife."

Claim.—"I am aware that the noses of oysters have been broken in order to give entrance to the knife by inserting them between the tines of a common fork, or other similar instrument, and therefore I do not claim the use of parallel cheeks for this purpose; but what I claim is, combining the said cheeks with the knife in one instrument, whereby the opening of oysters is accomplished with greater ease and expedition."

80. For *Improved Slitting Gauges;* James Ballard, Ashtabula, Ohio.

Claim.—"What I claim is, the slitting gauge head, made in two sections, with or without friction rollers, when said sections are united together at the centre of their length by a pin, or its equivalent, substantially as described. Likewise, the arrangement of the friction rollers, for the purpose described."

81. For an *Improved Faucet;* Richard M. Bouton, West Troy, N. Y.

Claim.—"I do not claim the discovery of any new principle; neither do I claim any of the parts separately considered, as they may have been used for a similar purpose by others; but what I claim is, the combination of the piston, cam, and lever, substantially as described, with or without the toggle joint, for the purpose of closing the valves of liquor faucets."

82. For an *Improved Fly Trap;* David Flanders and Samuel K. Flanders, Parishville, New York.

Claim—"What we claim is, the horizontal circular rotating disk, divided on its upper surface by the ledges into sections, which sections, as the disk rotates, pass underneath a cover of the box, which box contains a wiper that sweeps or traverses over the surfaces of the sections as they pass under the cover, and throws the flies into the box and behind the wiper, the disk and wiper being operated by clock machinery, or its equivalents, as described."

83. For an *Improvement in Grass Harvesters;* Martin Hallenbeck, Albany, N. Y.

Claim.—"What I claim is, the peculiar construction of the fingers described, viz: having ribs at the lower parts of the fingers, and vertical slots passing through the fingers on each side of the ribs and inclined plates attached to the fingers and ledges at each side; the plates preventing the sickle from clogging, and the ledges preventing the grass from being thrown out by the action of the teeth."

84. For an *Improvement in Cleaning Cotton and other Fibrous Substances;* Julius C. Hurd, Medway, Mass.

Claim.—"I do not claim the use of teeth made of pointed wire and secured to the beaters of cotton pickers; neither do I claim the application of springs to the concave of machines for operating upon fibrous materials; but what I do claim is, 1st, The use of the peculiar combing beater described, the teeth being so curved as to bring the beater very near to the feed rollers, and united with each other at their bases, in the manner of

saw teeth, for the purpose set forth. 2d, The peculiar method described, of applying springs to the slats of the grating beneath the beaters, each slat being furnished with independent springs, whereby the moats, as they fall upon the grating, are instantly knocked through the spaces beneath the slats, and are not carried round by the beater to be again entangled with the material, the slats yielding to permit the impurities to pass between them. 3d, The introduction of heated air into machines for picking and dusting cotton, by which a greater uniformity of the numbers of the yarn is obtained, and the material is more thoroughly and readily cleansed."

85. For an *Improved Ticket Box for Railroad Cars;* David A. Hopkins, Elmira, N. Y.

Claim.—"What I claim is, the box, constructed as described, viz: said box having a sliding frame in front, provided with a glass, and having spaces or chambers at its upper part formed by the plates at the back of the frame for the reception of the tickets, the tickets being retained in said spaces or chambers by means of the springs, and forced at the back of the lower part of the box when pressed down from the spaces by means of the springs, as set forth."

86. For an *Improvement in Operating Dumping Cars;* Abram C. Johnson, Meadville, Pennsylvania.

Claim.—"I do not claim transporting earth or other substances, by means of cars attached to a chain passing over pulleys, the chain being endless or otherwise; nor do I claim the arrangement of an upper track above the lower, so that one set of cars may pass above, while the other passes on the lower rails, as this has been done before; but what I claim is, the construction of the balance beams, arranged as described, for the purpose of passing one set of cars over another set, running in an opposite direction on the same track. Also, the arrangement of the rails, and, in combination with that of the car wheels, as described, for the purpose of rendering the cars self-dumping, or any other modification of the same, which may be substantially equivalent to it."

87. For an *Improvement in Cooking Oysters;* Lawson P. Keach, Baltimore, Md.

Claim.—"I do not claim, of itself, cooking by jets of gas applied to the shell or covering of the article of food to be roasted; but I do claim the method described of roasting oysters, or other articles of food having a shell or similar natural covering, by arranging the oysters on supports at a suitable distance apart, for the play of the flame of gas issuing from gas pipes or burners, on or against their shells, when the said burners are so arranged that the flame of the one burner jetting horizontally, or slightly dipping from the horizontal position, impinges and acts upon the top shell of one oyster, and the bottom shell of another, whereby the fish is more thoroughly cooked, and one burner serves for two oysters, as specified."

88. For an *Improved Fire Escape;* Geo. W. Keller, Philadelphia, Pa.

Claim.—"I claim the double chain, in combination with the friction rollers and guards, substantially as set forth."

89 For an *Improvement in Processes for Bleaching Flax;* J. Augustus Roth and Jos. Lea, Philadelphia, Pa.; patented in England, May 26, 1853.

Claim.—"What I claim is, the process of distributing the flax, fibre, or yarn, upon combs, or equivalent devices, and agitating the same when immersed in chemical bleaching solutions, in the manner and for the purpose substantially as described."

90. For *Improved Machines for Filling Match Frames;* A. Sohn, Monroeville, Ohio.

Claim.—"What I claim is, 1st, The combination of the bottomless shaking or reciprocating box or hopper and the fixed bed, which is grooved transversely to the motion of the box, but longitudinally to the direction of the matches, substantially as described, for the purpose of separating a number of matches, and laying them parallel in a row at a required distance apart. 2d, The reciprocating series of rods, in combination as described, with the grooved bed, for the purpose of pushing the matches longitudinally from the grooves into the frame. 3d, Placing the match frame, for the purpose of being filled, in an upright fixed frame, which is furnished with a sliding balanced cross-piece, containing a movable step, which is capable of being protruded through the said cross-piece between the sides of the match frames, and withdrawn therefrom, for the purpose of receiving the slats and matches nearly on a level with the grooved bed, and lowering them into the match frames until the latter are full, and then being withdrawn therefrom to leave the

matches in the frames, and leave the frames free to be taken from the machine, substantially as described."

91. For an *Improved Machine for Opening Oysters;* Wm. H. Towers, Philada., Pa.

Claim.—"What I claim is, opening oysters and other bivalves, without injury to the hands, by firmly inclosing them between jaws, and forcing a knife, having spring guides on its sides, of the form described, between the shells, in the manner set forth."

92. For an *Improvement in Maize Harvesters;* W. Lapham, Executor of Seneca Lapham, deceased, late of Salem, Ohio.

Claim.—"I do not claim the device for cutting the stalks; what I claim is, the method of arranging and operating the reel, that is, hanging the reel on a frame working vertically in ways, and supplied with suitable stops for receiving and discharging, at intervals, the cut maize, substantially as set forth."

APRIL 25.

93. For an *Improvement in Revolving Fire Arms;* Josiah Ells, Pittsburgh, Penna.

Claim.—"What I claim is, the extension on the fore part of the rotating chambered breech, as a prevention of the fouling of the spindle by the smoke in firing, and also as a means of connecting and locking the breech with the barrel, as set forth. The connecting and locking the barrel and breech to the lock, by means of a bracket and spring extending in front of the lock plate, in the manner described. I disclaim originality in the combining of a rotating chambered breech with a barrel and lock, only in the particular manner I have set forth; neither do I use what is called the recoil shield, as such, the collar upon the extension sustaining or preventing the actual recoil of the breech. Also, the use of the vibrating tooth and the spring in the hammer."

94. For an *Improvement in Distilling and Condensing Apparatus;* Jas. R. Stafford, Brooklyn, N. Y.

Claim.—"What I claim is, the employment, for the purpose of separating the more and less volatile products of distillation, of a vessel which has an opening for the escape or withdrawal of condensed matters, and another opening for the escape of the more volatile matters, and which has its temperature regulated by the admission of steam or air through a pipe passing through its interior, or through a chamber surrounding it, substantially as set forth."

95. For an *Improvement in Vinous Fermenting Liquids in Close Vessels;* A. Harvey and C. Guild, Cincinnati, Ohio.

Claim.—"What we claim is, 1st, The application of pumps, or of exhausters and blowers, or other equivalent apparatus, to draw the gas from one fermenting vat, and force it into the fermenting liquid in another or the same vat, as described. 2d, The arrangement of apparatus whereby a return current is created, and the circulation of the gases caused, that is to say, the return pipe and pumps, or mechanism, substantially as set forth. 3d, The check valves, the disseminating pipes, for the purpose of preventing any contrary passage of the liquid from vat to vat, from that which is intended, in combination with the turn-off cocks, for the purpose of isolating a portion of the vats, and shortening the circuit when desired, and the whole in combination with the pumps or valved pistons, for the acceleration of the circulation, and by this means equalizing its action and removing the danger of bursting the vats. 4th, The pipe, having two discharge nozzles at different heights of the liquid of the condensing vat and cocks in the upper nozzle, in order to regulate the amount of vent or discharge."

96. For an *Improved Ditching Plough;* J. C. Tiffany, Coxsackie, N. Y.

Claim.—"What I claim is, 1st, One or more adjustable coulters or cutters, in combination with a permanent coulter, and both in combination with one or more adjustable elevators, with a mould-board or mould-boards attached, substantially as described. I do not claim any of the parts or devices enumerated, separately, or alone, but in combination, and in combination only. 2d, I claim the flexible adjustable spreader, for removing the earth from, or returning it to, the ditch, as required. 3d, The flexible adjustable spreader, in combination with the plough, for the purposes set forth. 4th, The devices, substantially such as are described, or their equivalents, for changing the position of the rear end of the beam, in combination with the angular slot and curved plate, substantially as described."

97. For an *Improvement in Cast Iron Car Wheels;* Geo. W. Glass, Allegheny, Pa.

Claim.—"What I claim is, not the corrugating the disk of cast iron car wheels to render them susceptible of contraction and expansion, nor yet do I claim the making of car wheels with a space between the inner and outer disks or sides, as both these devices are well known, nor the use of core holes in casting car wheels; but what I claim is, the constructing of cast iron car wheels of the shape and conformation described, being wheels with two disks, united at the rim and tread, and at the hub, by a semi-circular or semi-elliptical arch, the greatest external curvature of the inner disk being immediately under the flanch, and below the point of contact of the flanch and tread, for the better supporting the flanch and tread, in combination with the braces, of the construction and shapes shown in the drawings."

98. For an *Improvement in Traveling Bridges;* Frederick Field, Adrian, Michigan.

Claim.—"I do not claim a retractile draw-bridge, nor any of the appliances by which such bridges are moved; my bridge acts as a carriage as well as bridge, receiving its load upon it while resting on the abutments, or one side of the span or spans to be crossed, carries the load over, and rests upon the other side to receive its return load, and so back and forth, leaving the spaces between the piers open for vessels, &c."

99. For an *Improvement in Railroad Car Seats;* Wm. E. Milligan, City of N. Y.

Claim.—"I do not claim the device of making reversible seats, in which the back turns down to form the seat, and vice versa, such having been used before; but what I claim is, supporting the angle of the seat and back upon ways, or in any equivalent manner, whereby it is transferred from one side of the chair frame to the other in making the reversal, substantially as described."

100. For an *Improved Mode of Securing Stones in Foundations;* J. P. Avery, Stonington, Connecticut.

Claim.—"I do not claim the use of dowel joggles of double dovetail form for uniting stone together, as such have before been used; nor yet do I claim making tight the vertical joints, and binding the two courses together by a dowel or key driven through the stone in the course, and into or between the stones in the under course, as such has before been done by wedges let into the ends of the dowel, and serving to spread it to make tight the joints in and between the courses; but I do claim the combination and arrangement specified, of the dovetails and tightening key, or its equivalent, when the said dovetails are constructed of taper flanch form, fitting within or under projecting lips to the dovetail recesses in the stones, to draw and clamp the two courses together, the said dovetails fitting within the one stone of the one course, and the two stones of another course, and being driven home by the intervening key, to make tight the vertical and horizontal joints in the two courses, and to clamp the two courses together firmly and permanently."

101. For an *Improved File or Bill Holder;* Thomas W. Brown, Boston, Mass.

Claim.—"I am aware that spring-boards have been applied to the two boards of a bill or file holder, so as to draw them towards one another, and upon papers interposed between them, and to admit of their being moved apart from one another, such bands having generally been made in whole or in part of india rubber; I therefore do not claim the application of spring bands to the boards; but what I do claim is, the arrangement or application of the circular grooved annulus, a spiral spring and the cords together, and with respect to the two boards, in manner so as to operate substantially as specified."

102. For an *Improvement in Fire Arms;* Chas. Buss, Marlboro', N. H.

Claim.—"What I claim is, the improvement of making the trigger-guard so that it shall not only perform the function of a guard to the trigger, but that of a spring to press the straddler or index holder against the catch wheel, as specified."

103. For an *Improved Rotary Pump;* Reuben Bundine, Washington City, D. C.

"The nature of my invention consists in so combining the action of the screw for delivery of the water into the case or drum, with the revolving arms or ribs formed of involutes of a circle, that by the combined action or effect of these mechanical devices, I am enabled to elevate water at a greatly reduced expenditure of power."

Claim.—"What I claim is, the combination of the screw or screws upon the rotary shaft with the radial curved wings or driver, (although I do not confine myself to the curved form, as straight ones may be used,) the whole contained within a case or drum for receiving and directing the water intended to be elevated in the manner set forth."

104. For an *Improvement in Machinery for Laying Rope;* Stephen Bazin and James A. Bazin, Canton, Mass.

Claim.—"What we claim is, adapting the machinery for forming both 'hard' and 'soft' cordage by means of the ring, so actuated by the circular plate, and its rollers made to revolve or held stationary, as set forth, so as to form an extra twist in the rope when desirable, by giving an additional revolution to the bobbin frames, as described. Also, our improvement in the movable crane, the same consisting in forming it of a bent shape with the right angular hinged arm, operating as described, so as to feed the rope in a direction parallel with the axis of the winding reel. Also, stretching the rope after it is laid, by means of the double pulley with grooves of different diameter, as set forth."

105. For an *Improvement in Feeding Machines for Feeding Sheets of Paper to Printing Presses;* Henry Clark, New Orleans, La.

Claim.—"I do not confine myself to the precise mechanical device described, for that may be modified or varied in many particulars; but what I claim is, loosening or detaching the top sheet of a layer of papers from those underneath it, by giving a part of said sheet a backward and forward motion, as herein shown, previously to its being operated upon by the pressure rollers, or other device of conveying it to the printing press, or other machine to which the sheet of paper is fed, for the purpose of insuring the feed of only a single sheet of paper at a time, as set forth."

106. For an *Improvement in Portable Folding Chair Bedsteads;* Geo. H. Cottam, Hampstead Road, England; patented in England, October 5, 1852.

Claim.—"I make no claim to the parts, separately; nor do I confine myself to the details, as herein given, provided the peculiar character of my invention be retained; but what I claim is, the mode described, of constructing folding sofa or bedstead chairs, viz: of a combination of the frames and jointed arms, as applied and made to operate together, substantially as specified."

107. For an *Improved Wedge Machine;* Geo. C. Jones, of Alna, and Peter King, of Whitefield, Maine.

Claim.—"What we claim is, 1st, The peculiar form of the chisel having two or more projecting chisels at right angles to the face of the main chisel, and an appendage for pushing back the spring, as described. 2d, The application of the spring and its projection, for the support of the wedge while being shaved. 3d, The peculiar form and arrangement of the grooves for holding the blocks to be shaved, and giving shape to the wedges while being shaved."

108. For an *Improved Mode of Operating the Feed Tables of Printing Presses;* Geo. Little, Utica, New York.

Claim.—"What I claim is, the mode substantially as described, of operating the feed tables of printing presses, together with the guides, composed of india rubber or other suitable resisting material."

109. For an *Improvement in Apparatus for Feeding Paper to Printing Presses;* W. Kuhlenshmidt and Wm. Hauff, City of New York.

"The nature of our invention consists in the employment of a semi-circular roller, or its equivalent, so arranged and operated that it will, in its backward movement from the paper cylinder, loosen or detach the top sheet of a layer of paper from those underneath it, and then lift up the back end of said sheet, and in its forward or return movement toward the paper cylinder, feed it to the fingers of the paper cylinder; the said feed roller being provided with some adhesive cement on that part which bears on the back end of the paper for the purpose of perfectly taking up the sheets."

Claim.—"What we claim is, 1st, The employment of a semi-circular roller, or its equivalent, so constructed, arranged, and operated, that it will, in its backward movement from the paper cylinder, loosen or detach the top sheet of a layer of paper from those underneath it, and then take hold of the back end of said sheet, and in its forward or return movement toward the paper cylinder raise the said back end of the sheet, and gradually separate the whole surface of the same from contact with the one under it, and then feed it to the fingers of the paper cylinder, substantially as described. 2d, We claim taking up the sheet by its back end instead of its front end, for the purpose set forth."

110. For an *Improved Field Fence;* Daniel R. Prindle, East Bethany, New York.

Claim.—"What I claim is, the method described, or its equivalent, of fastening together the adjacent posts or standards of a field fence; that is, by passing a piece of metal having a head on one end through two adjacent posts, and securing the same by a wedge, or its equivalent, at the other end, the standards or posts being so beveled as to cause any desired angle to be made by any two adjacent panels."

111. For an *Improvement in Glass Furnaces;* Frederick Schaum, Baltimore, Md.

Claim.—"What I claim is, making the external and internal configuration of the breast-work of the furnace wall with the re-entering portions so as partly to embrace the pots, and to furnish room for additional or extra tease or ring holes, substantially as described."

112. For an *Improvement in Brick Making;* J. C. Fr. Salomon, Washington, D. C.

Claim.—"I claim the combination of the swing crane, mould box, and platen for pressing brick, arranged and operating together, as set forth."

113. For an *Improvement in Forming and Hardening Hat Bodies;* Albert Spencer, City of New York, and Augustus Loeschner, Brooklyn, New York.

Claim.—"What we claim is, the use and arrangement of the series of blow pipes, as substantially set forth, when used in combination with the two or more fan brushes and feeding apparatus, for the purposes set forth."

114. For an *Improvement in Forming Roofs;* W. Sterling, Bridgeport, Connecticut.

Claim.—"I do not claim the application of cements for roofs, or plastering the same on boards or timber, the contraction and expansion of which causes the cement to crack; nor the plastering of cement on lath of any kind whatever, as this has been done before; but what I claim is, the use of reticulated wire imbedded in cement where cloth is used as a foundation, for the purpose set forth."

115. For *Improved Bullet Moulds;* Wm. Montgomery Storm, City of New York.

Claim.—"What I claim is, 1st, A hand bullet mould, so constructed that it may be forced open against the adhesion of the lead, so as to deliver its ball by the pressing together of its handles by the strong grasp of a single hand, whereby are attained the important ends described. 2d, In combination with a mould, constructed as above described, I claim the shears which are operated by the strong grasp of a single hand on the handles, or their equivalents, whereby the ball is deprived of its sprue and released from its matrix by the closing or compressing together of the handles."

116. For an *Improvement in Machines for Cutting and Skiving Boot Counters;* Varanes Snell, North Bridgeport, Massachusetts.

Claim.—"What I claim is, 1st, Arranging the knife at a proper angle in a traversing knife carriage which has a reciprocating motion, in the arc of a circle for rounding the counter and chamfering its edges, substantially as described. 2d, Holding the clamp upon the leather while the counter is being cut, and releasing it from the same after the operation is finished, by means of the traversing pawl, acting in combination with the lever and notched plates, as set forth. 3d, A machine for cutting and skiving boot and shoe counters, which has a clamp for holding the leather while it is being cut, and for releasing it after the operation is performed, and a traversing knife which moves in the arc of a circle, and rounds and skives the counter at the same time, as set forth."

117. For an *Improvement in Oilers for Machinery;* De Witt C. Smiley, City of N. Y.

Claim.—"I do not claim cans having flexible bottoms, as such are well known; but what I claim is, the combination of the interior chamber with the can having a flexible bottom, when said interior chamber has its bottom extended to fill the interior diameter of the can, and form a diaphragm dividing the can into an upper and lower chamber, said diaphragm provided with valves, one opening upward and the other downward, arranged and operating in the manner described."

118. For an *Improvement in Railroad Car Seats;* William B. Thomas and Samuel Hickok, Buffalo, New York.

Claim.—"We claim the combination of railroad car seats with hinged or jointed legs, constructed and operated substantially as described."

119. For an *Improved Syringe Eye Bath;* Simeon Fowle, Pembroke, New York.

Claim.—"I disclaim the invention of a ball, or of a cap, and of elastic cups for cupping; but I claim the combination of the rimmed cap, connected tubularly with ball, and arranged and operating substantially as described, to be used for purposes and in cases as set forth."

120. For an *Improved Re-Action Water Wheel;* Isaac True, Rochester, Indiana.

Claim.—"What I claim is, the employment of the hooked surfaces, and the curved projecting surfaces, in combination with the indented ring, substantially in the manner specified, in the construction of percussion and re-action water wheels, whereby the effective force of the percussion is greatly increased, as set forth."

121. For an *Improvement in Invalid Bedsteads;* C. D. Van Allen, City of New York.

Claim.—"What I claim is, the arrangement and combination of the elevating and depressing bed with the stationary suspension mattress, whereby the bed is raised to and lowered from the patient when necessary, instead of moving the patient, thus avoiding the necessity of moving or disturbing the patient in the least."

122. For an *Improvement in Guard Fingers of Harvesters;* William T. Ketchem, Assignor to Rufus L. Howard, Buffalo, New York.

Claim.—"What I claim is, moulding and casting the blank for the tooth in the open form described, (without a chill,) then mollifying, dressing up, and bending them into the proper shape, as required."

Re-Issues for April, 1854.

1. For an *Improvement in the Cotton Gin;* Jones McCarthy, Orange Springs, Florida; dated July 3, 1840; re-issued April 18, 1854.

Claim.—"What I claim is, the combination of a stripping plate, breast plate, and drawing roll, substantially as set forth."

2. For an *Improvement in Fire and Burglar Proof Safes;* F. C. Goffin, City of New York, Assignor to A. B. Ely, Boston, Massachusetts; dated Feb. 14, 1854; re-issued April 25, 1854.

"The nature of my invention consists in filling the space between the two casings of a safe or door, either wholly or in part, with glass or slag in a vitrified state, for the purpose of rendering the safe or door fire-proof, and also proof against burglars, glass being a poor conductor of heat, and so hard as to prevent the operation of boring or drilling through the sides of the safe or door."

Claim.—"I do not claim forming safes or doors with double casings; but what I claim is, the use of glass or slag in a vitrified state, in the filling of safes or vault doors, either poured moulten into the spaces, or inserted in plates, substantially as described."

Designs for April, 1854.

1. For *Cooking Stoves;* William T. Coggshall, Fall River, Mass.; dated April 18, 1854.

Claim.—"What I claim is, the ornamental design for the side and end plates, the feet and the doors."

2. For a *Door and Panel of Cooking Stoves;* M. C. Burleigh, Great Falls, New York; dated April 25, 1854.

Claim.—"What I claim is, the arrangement and combination of the central ornament with the rays and mouldings."

3. For *Fronts of Clock Cases;* Wm. B. Lorton, City of N. Y.; dated April 25, 1854.

Claim.—"What I claim is, the design and configuration of the plate represented."

4. For *Air-Tight Stoves;* Garrettson Smith and Henry Brown, Philadelphia, Pennsylvania; dated April 25, 1854.

Claim.—"What we claim is, the design, configuration and arrangement of the several ornaments in bas-relief."

5. For *Stove Plates;* John Burgess, Assignor to Geer & Co., Troy, New York; dated April 25, 1854.

Claim.—"What I claim is, the ornamental design and configuration of stove plates."

LAW REPORTS OF PATENT CASES.

HENRY O'RIELLY, EUGENE L. WHITMAN, AND W. F. B. HASTINGS, *Appellants, vs.* SAMUEL F. B. MORSE, ALFRED VAIL, AND FRANCIS O. J. SMITH, *Appellees.*

(Continued from page 338.)

Mr. JUSTICE GRIER, Mr. JUSTICE NELSON, and Mr. JUSTICE WAYNE dissented; and Mr. JUSTICE GRIER delivered the dissenting opinion, as follows:—

I entirely concur with the majority of the Court that the appellee and complainant below, Samuel F. B. Morse, is the true and first inventor of the recording telegraph, and the first who has successfully applied the agent or element of nature, called electro-magnetism, to printing and recording intelligible characters at a distance; and that his patent of 1840, finally reissued in 1848, and his patent for his improvements, as reissued in the same year, are good and valid; and that the appellants have infringed the rights secured to the patentee by both his patents. But, as I do not concur in the views of the majority of the Court in regard to two great points of the case, I shall proceed to express my own.

I.—Does the complainant's first patent come within the proviso of the sixth section of the act of 1839; and should the term of fourteen years, granted by it, commence from the date of his patent here, or from the date of his French patent in 1838?

If the complainant's patent is within the provisions of this section, I cannot see how we can escape from declaring it void. The proviso declares, that "in all cases every *such patent* (issued under the provisions of that section) shall be limited to the term of fourteen years from the date or publication of such foreign letters patent." It is true it does not say that the patent shall be void if not limited to such term on its face; but it gives no power to the officer to issue a patent for a greater term. If the patent does not show the true commencement of the term granted by it, the patentee has it in his power to deceive the public by claiming a term of fourteen years, while in reality it may be no more than one.

But, I am of opinion, that the patent in question does not come within this proviso. The facts of the case, as connected with this point, are these: On the 6th of October, 1837, Morse filed, in the office of the Commissioner of Patents, a caveat, accompanied by a specification, setting forth his invention, and praying that it may be protected till he would finish some experiments necessary to perfect its details. On the 9th of April, 1838, he filed a formal application for a patent, accompanied by a

specification and drawings. On the 1st of May, 1838, the Commissioner informs him *that his application has been granted.* Morse answers on the 15th of May, that he is just about to sail for Europe, and asks the Commissioner to delay the issue of his patent for the present, fearing its effect upon his plans abroad.

On the 30th of October, 1838, he obtained his useless French patent. On his return to this country, in 1840, he requests his patent to be perfected and issued. In his application filed on 9th of April, 1838, there was an oversight in filling up the day and month. This clerical omission was wholly immaterial, but *ex majori cautela*, a second affidavit was filed, and the patent issued on the 20th of June, 1840, for the term of 14 years from its date.

The application of 1838 had a set of drawings annexed to the specification. The second set of drawings required by the 6th section of the act of 1837, being for the purpose of annexation to the patent, they were entirely unnecessary till the patent issued, and are not required by law to accompany the application when first made, and the want of them cannot affect the validity of the application.

In many instances, owing to various causes, the patent is not issued till many months, and sometimes a year or more after the application. The commissioner requires time to examine the specification; he may suggest difficulties and amendments; and disputes often arise which delay the issuing of the patent. But the application does not require to be renewed, and is never considered abandoned in consequence of such delay. It still remains as of the date of its filing for every purpose beneficial to the applicant. The law does not require that the specification and its accompaniments should be in the precise form which they afterwards assume in the patent. It requires only that the application be "*in writing*," and that the applicant should "make oath that he is the original inventor," &c. The other requirements of the act must precede the issuing of the patent, but make no part of the application, and are not conditions precedent to its validity. In the present case, we have, therefore, a regular application in due form, accompanied by a specification and drawings, filed on the 9th of April, 1838. It has not been withdrawn, discontinued, or abandoned. There is nothing in the act of Congress which requires that the patent should be issued within any given time after the application is filed, or which forbids the postponement of it for a time at the suggestion either of the applicant or the officer; nor is there any thing in the general policy of the patent laws which forbids it. On the contrary, it has always been the practice, when a foreign patent is desired, to delay the issuing of the patent here, after application filed, for fear of injuring such foreign application. It forms no part of the policy of any of our patent acts to prevent our citizens from obtaining patents abroad. By the Patent Act of 1793, the applicant must swear that his invention was not known or used *before the application.* The filing of the application was the time fixed for determining the applicant's right to a patent. If a patent had issued abroad, or the invention had been in use or described in some public work *before that time*, it was a good defence to it. The time of filing the application was, therefore, made by law the criterion of his right to claim as *first inventor.*

A foreign patent, subsequent to the date of his application, would not be set up as a defence against the domestic patentee. The American inventor, who had filed his application and specification at home, was thus enabled to obtain his patent abroad without endangering his patent at home. This was a valuable privilege to American citizens, and one of which he has never been deprived by subsequent legislation; and thus the law stood till the act of 4th July, 1836.

Before this time, the right to obtain a patent was confined to American citizens, or those who had filed their intentions to become such. The policy of this act was to encourage foreign inventors to introduce their inventions to this country, but in doing so, it evinces no intention of limiting our own citizens by taking away from them rights which they had hitherto enjoyed. Accordingly, it gave an inventor, who had obtained a patent abroad, (and who was generally a foreigner,) a right to have one here, provided he made *his application* here within six months after the date of his foreign patent. Neither the letter nor the spirit of this act interferes with the right to an inventor, who has filed *his application* here, from obtaining a patent abroad, or his right to a term of fourteen years from the date of his patent.

In 1838, therefore, when complainant filed his application, he was entitled to such a patent. But in March, 1839, an act was passed, by the sixth section of which it is alleged the complainant's rights have been affected. That section is as follows:—"That no person shall be debarred from receiving a patent for any invention, &c., as provided in the act of 4th July, 1836, to which *this is additional*, by reason of the same having been patented in a foreign country more than six months prior to his application; *provided* that the same shall not have been introduced into public and common use in the United States prior *to the application for such patent. And provided also*, that in all cases *every such patent* shall be limited to the term of fourteen years from the date or publication of such foreign letters patent." Now the act of 1836, as we have shown, had given a privilege to foreign patentees to have a patent within six months after date of such foreign patent; it had not affected, in any manner, the right previously enjoyed by American citizens to take out a foreign patent *after filing their application here.* This section gives "*additional*" rights to those who had first taken out patents abroad, and holding out an additional encouragement to foreign inventors to introduce their inventions here, subject to certain conditions contained in the provisoes. Neither the letter, spirit, nor policy of this act, have any reference to, or bearing upon, the case of persons who had first made their applications here. To construe a proviso, as applicable to a class of cases not within its enacting clause, would violate all settled rules of construction. The office of a proviso is either to except something from the enacting clause, or to exclude some possible ground of misinterpretation, or to state a condition to which the privilege granted by the section shall be subjected. Here the proviso is inserted, to restrain the general words of the section, and impose a condition on those who accept the privileges granted by the section. It enlarged the privileges of foreign patentees, which had before been confined to six months, on two conditions: first, provided the invention patented abroad had not been intro-

duced into public use here; and secondly, on condition that *every such patent* should be limited to its term. The general words, "*in all cases*," especially when restrained to "*every such patent*," cannot extend the condition of the proviso beyond such cases as are the subject-matter of legislation in the section.

The policy and spirit of the act are to grant privileges to a certain class of persons which they did not enjoy before; to encourage the introduction of foreign inventions and discoveries, and not to deprive our own citizens of a right heretofore enjoyed, or to affect an entirely different class of cases, when the *applications had been filed here before* a patent obtained abroad.

It is supposed that certain evils might arise by allowing an applicant for a patent here to delay its issue till he can obtain a foreign patent. To which it is a sufficient answer to say, that if such evil consequences should be found to exist, it is for Congress to remedy them by legislation. It is no part of the duty of this Court, by a forced construction of existing statutes, to attempt the remedy of possible evils by anticipation.

I am therefore of opinion that the complainant's patent, as renewed, contained a valid grant of the full term of fourteen years from its original date.

II.—The other point in which I cannot concur with the opinion of the majority, arises in the construction of the eighth claim of complainant's first patent, as finally amended. The first claim, as explanatory of all that follow, should be read in connexion with the eighth—they are as follows:—First—Having thus fully described my invention, I wish it to be understood that I do not claim the use of the galvanic current or currents of electricity for the purpose of telegraphic communications generally; but what I specially claim as my invention and improvement, is making use of the motive power of magnetism, when developed by the action of such current or currents substantially as set forth in the foregoing description of the first principal part of my invention, as means of operating or giving motion to machinery which may be used to imprint signals upon paper or other suitable material, or to produce sounds in any desired manner for the purpose of telegraphic communication at any distances. The only ways in which the galvanic current had been proposed to be used prior to my invention and improvement, were by bubbles resulting from decomposition, and the action or exercise of electrical power upon a magnetized bar or needle; and the bubbles and the deflections of the needles thus produced, were the subjects of inspection, and had no power, or were not applied to record the communication. I therefore characterized my invention as the first recording or printing telegraph by means of electro-magnetism.

There are various known modes of producing motions by electro-magnetism, but none of these had been applied prior to my invention and improvement, to actuate or give *motion* to printing or recording machinery, which is the chief point of my invention and improvement.

Eighth.—I do not propose to limit myself to the specific machinery or parts of machinery described in the foregoing specification and claims, the essence of my invention being the use of the motive power of the electric or galvanic current, which I call electro-magnetism, however

developed, for marking or printing intelligible characters, signs, or letters, at any distances, being a new application of that power, of which I claim to be the first inventor or discoverer.

The objection to this claim is, that it is *too broad*, because the inventor does not confine himself to specific machinery or parts of machinery as described in his patent, but claims that the essence of his invention consists in the application of electro-magnetism as a motive power, however developed, for printing characters at a distance. This being a new application of that element or power, of which the patentee claims to be the first inventor or discoverer.

In order to test the value of this objection as applied to the present case, and escape any confusion of ideas too often arising from the use of ill-defined terms and propositions, let us examine, 1st. What may be patented, or what forms a proper subject of protection under the Constitution and acts of Congress relative to this subject.

2d. What is the nature of the invention now under consideration? It is a mere machine, and subject to the rules which effect a combination of mechanical devices to effect a particular purpose.

3d. Is the claim true in fact; and, if true, how can it be *too broad* in any legal sense of the term, as heretofore used, either in the acts of Congress or in judicial decisions?

4th. Assuming the hypothesis that it is too broad; how should that affect the judgment for costs in this case?

"1st. The Constitution of the United States declares that Congress shall have the power to promote the progress of science and *useful arts*, by securing, for limited times, to authors and inventors, the exclusive right to their respective writings and *discoveries*."

The act of Congress of 1836 confers this exclusive right, for a limited time, on "any person who has discovered or invented any *new and useful art*, *machine*, *manufacture* or *composition of matter*, or any new and useful improvements on any *art*, machine, manufacture, or composition of matter, not known or used by others before his or their discovery or invention thereof, and not, at the time of his application for a patent, in public use," &c.

A new and useful *art*, or a new and useful improvement on any known art, is as much entitled to the protection of the law as a machine or manufacture. The English patent acts are confined to "manufactures," in terms; but the courts have construed them to cover and protect arts as well as machines; yet without using the term *art*. Here we are not required to make any latitudinous construction of our statute for the sake of equity or policy; and surely we have no right, even if we had the disposition, to curtail or narrow its liberal policy by astute or fanciful construction.

It is not easy to give a precise definition of what is meant by the term "*art*," as used in the acts of Congress. Some, if not all, the traits which distinguish an *art* from the other legitimate subjects of a patent, are stated with clearness and accuracy by Mr. Curtis, in his treatise on patents. The term *art* "applies," says he, "to all those cases where *the application of a principle is the most important part of the invention*, and where the machinery, apparatus, or other means by which the principle is applied

are incidental only, and not of the essence of his invention. It applies also to all those cases where the result, effect, or manufactured article, is old, but the invention consists in a new process or method of producing such result, effect, or manufacture." (Curt. Pat., 80.)

A machine, though it may be composed of many parts, instruments, or devices combined together, still conveys the idea of unity. It may be said to be invented, but the term "*discovery*" could not well be predicated of it. An art may employ many different machines, devices, processes, and manipulations, to produce some useful result. In a previously known art, a man may discover some new process, or new application of a known principle, element, or power of nature, to the advancement of the art; and will be entitled to a patent for the same, as an improvement in the art; or he may invent a machine to perform a given function, and then he will be entitled to a patent only for his machine. That improvement in the arts which consist in the new application of some known element, power, or physical law, and not in any particular machine or combination of machinery, have been frequently the subject of patents, both in England and this country, the cases in our books most amply demonstrate. I have not time to examine them at length; but would refer to James Watt's patent for a method of saving fuel in steam-engines, by condensing the steam in separate vessels, and applying non-conducting substances to his steam-pipes; Clegg's patent for measuring gas in water—Jupe *vs.* Pratt: Webster's Pat. Cases, 103—and the celebrated case of Neilson's patent for the application of hot blast, being an important improvement in the art of smelting iron.

In England, where their statute does not protect an art in direct terms, they have made no clear distinction between an art and an improvement in an art, and a process, machine or manufacture. They were hampered and confined by the narrowness of the phraseology of their patent acts. In this country the statute is as broad as language can make it; and yet if we look at the titles of patents as given at the Patent Office, and the language of our courts, we might suppose that our statute was confined entirely to *machines*, notwithstanding in Knoop *vs.* The Bank (4 Washington, C. C. R. 19), Mr. Justice Washington supported a patent which consisted in nothing else but a new application of copper plates to both sides of a bank bill as a security against counterfeiting. The new application was held to be an *art*, and therefore patentable. So the patent in McClurg *vs.* Kingsland (1 How. 204) was in fact for an improvement in the art of casting chilled rollers by conveying the metal to the mould in a direction approaching to the tangent of the cylinder, yet the patentee was protected in the principle of his discovery (which was but the application of a known law of nature to a new purpose) against all forms of machinery embodying the same principle. The great art of printing, which has changed the face of human society and civilization, consisted in nothing but a new application of principles known to the world for thousands of years; no one could say it consisted in the type or the press, or in any other machine or device used in performing some particular function more than in the hands which picked the types or worked the press. Yet if the inventor of printing had, under this narrow construction of our patent law, claimed his *art* as something distinct from the ma-

chinery, the doctrine now advanced would have declared it unpatentable to its full extent as an *art*, and that the inventor could be protected in nothing but his first rough types and ill-contrived press.

I do not intend to review the English cases which adopt the principle for which I now contend, notwithstanding their narrow statute. But would refer to the opinion of my brother Nelson, in 14 How. 177; and will add, that Mr. Justice McLean, in delivering the opinion of the Court in that case, quotes with approbation the language of Lord Justice Clerk in the Neilson case, which is precisely applicable to the question before us. He says, "The specification does not claim anything as to form, nature, shape, materials, numbers or mathematical character of the vessel or vessels, in which the air is to be heated, or as to the mode of heating such vessels." Yet this patent was sustained as for a new application of a known element, or to use correct language, as an improvement in the art of smelting iron, without any regard to the machinery or parts of machinery used in the application.—Such I believe to be the established doctrine of the English courts.

He who first discovers that an element or law of nature can be made operative for the production of some valuable result, some new art, or the improvement of some known art, who has devised the machinery or process to make it operative, and introduced it in a practical form to the knowledge of mankind, is a discoverer and inventor of the highest class. The discovery of a new application of a known element or agent may require more labor, expense, persevering industry and ingenuity than the invention of any machine; sometimes, it is true, it may be the result of a happy thought or conception, without the labor of experiment, as in the case of the improvement in the art of casting chilled rollers, already alluded to. In many cases it is the result of numerous experiments; not the consequence of any reasoning *a priori*, but wholly empyrical, as in the discovery that a certain degree of heat, when applied to the usual processes for curing india rubber, produced a substance with new and valuable qualities.

The mere discovery of a new element, or law, or principle of nature, without any valuable application of it to the arts, is not the subject of a patent. But he who takes this new element or power, as yet useless, from the laboratory of the philosopher, and makes it the servant of man, who applies it to the perfecting of a new and useful art, or to the improvement of one already known, is the benefactor to whom the patent law tenders its protection. The devices and machines used in the exercise of it may or may not be new, yet, by the doctrine against which I contend he cannot patent them, because they were known and used before. Or if he can, it is only in their new application and combinations in perfecting the new art. In other words, he may patent the new application of the mechanical devices, but not the new application of the operative element which is the essential agent in the invention. He may patent his combination of machinery, but not his art.

Where a new and hitherto unknown product or result beneficial to mankind is effected by a new application of any element of nature, and by means of machines and devices, whether new or old, it cannot be denied that such invention or discovery is entitled to the denomination of

a "new and useful art." The statute gives the inventor of an art a monopoly in the exercise of it, as fully as it does to the inventor of a mere machine; and any person who exercises such new art without the license of the inventor, is an infringer of his patent, and of the franchise granted to him by the law as a reward for his labor and ingenuity in perfecting it. A construction of the law which protects such an inventor in nothing but the new invented machines, or parts of machinery used in the exercise of his art, and refuses it to the exercise of the art itself, annuls the patent law. If the law gives a franchise or monopoly to the inventor of an art, as fully as to the inventor of a machine, why shall its protection not be coextensive with the invention in one case as well as in the other? To look at an art as nothing but a combination of machinery, and give it protection only as such against the use of the same or similar devices, or mechanical equivalents, is to refuse it protection *as an art*. It ignores the distinction between an art and a machine; it overlooks the clear letter and spirit of the statute, and leads to inextricable difficulties; it is viewing a statute or a monument through a microscope.

The reason given for thus conferring the franchise of the inventor of an art to his machines and parts of machinery, is, that it would retard the progress of improvement, if those who can devise better machines or devices differing in mechanical principle from those of the first inventor of the art, or, in other words, who can devise an improvement in it, should not be allowed to pirate it.

To say that a patentee who claims the art of writing at a distance by means of electro-magnetism, necessarily claims all future improvements in the art, is to misconstrue it, or draw a consequence from it not fairly to be inferred from its language. An improvement in a known art is as much the subject of a patent as the art itself; so also is an improvement on a known machine. Yet, if the original machine be patented, the patentee of an improvement will not have a right to use the original. This doctrine has not been found to retard the progress of invention in the case of machines; and I can see no reason why a contrary one should be applied to an art.

The claim of the patentee is, that he may be protected in the exercise of his art as against persons who may improve or change some of the processes or machines necessary in its exercise. The Court, by deciding that this claim is too broad, virtually decides that such an inventor of an improvement may pirate the art he improves, because it is contrary to public policy to restrain the progress of invention; or, in other words, it may be said that it is true policy of the courts to refuse that protection to an art which it affords to a machine, and which it is the policy of the Constitution and the laws to grant.

2d. Let us now consider what is the nature of the invention now under consideration.

It is not a composition of matter, or a manufacture, or a machine. It is the application of a known element or power of nature to a new and useful purpose by means of various processes, instruments, and devices, and if patentable at all, it must come within the category of "*a new and useful art.*" It is as much entitled to this denomination as the original art of printing itself. The name given to it in the patent is generally

the act of the Commissioner, and in this, as in many other cases, a wrong one. The true nature of the invention must be sought in the specification. The word Telegraph is derived from the Greek, and signifies to "write afar off, or at a distance." It has heretofore been applied to various contrivances or devices to communicate intelligence by means of signals or semaphores which speak to the eye for a moment; but in its primary and literal signification of *writing, printing, or recording at a distance*, it never was invented, perfected, or put into practical operation, till it was done by Morse. He preceded Steinheil, Cook, Wheatstone, and Davy, in the successful application of the mysterious power or element of electro-magnetism to this purpose; and his invention has entirely superseded their inefficient contrivances. It is not only "a new and useful art," if that term means anything, but a most wonderful and astonishing invention, requiring tenfold more ingenuity and patient experiment to perfect it, than the art of printing with types and press, as originally invented.

3d. Is it not true, as set forth in this eighth claim of the specification, that the patentee was the first inventor or discoverer of the use or application of electro-magnetism to print and record intelligible characters or letters? It is the very ground on which the Court agree in confirming his patent. Now the patent law requires an inventor, as a condition precedent to obtaining a patent, to deliver a written description of his invention or discovery, and to particularly specify what he claims to be his own invention or discovery. If he has truly stated the principle, nature, and extent of his art or invention, how can the Court say *it is too broad*, and impugn the validity of his patent for doing what the law requires as a condition for obtaining it? And if it is only in case of a machine that the law requires the inventor to specify what he claims as his own invention and discovery, and to distinguish what is new from what is old, then this eighth claim is superfluous, and cannot affect the validity of his patent, provided his art is new and useful, and the machines and devices claimed separately are of his own invention. If it be in the use of the words "*however developed*" that the claim is to be adjudged too broad, then it follows that a person using any other process for the purpose of developing the agent or element of electro-magnetism than the common one now in use and described in the patent, may pirate the whole art patented.

But if it be adjudged that the claim is too broad, because the inventor claims the application of this element to his new art, then his patent is to be invalidated for claiming his whole invention, and nothing more. If the result of this application be a new and useful art, and if the essence of his invention consists in compelling this hitherto useless element to record letters and words at any distance, and in many places at the same moment, how can it be said that the claim is for a principle or an abstraction? What is meant by a claim being *too broad*? The patent law and judicial decisions may be searched in vain, for a provision for a decision that a patent may be impugned for claiming no more than the patentee invented or discovered. It is only when he claims something before known and used, something as new which is not new, either by mistake or intentionally, that his patent is affected.

The act of Congress requires the applicant for a patent to swear that "he is the original and first inventor of the art, machine," &c. It requires the Commissioner to make an examination of the alleged invention, "and if it shall appear that the same *has not been invented prior to the alleged invention*, he shall grant a patent, &c. But if it shall appear that the applicant is not the original and first inventor or discoverer thereof, *or that any part of that which is claimed as new had before been invented*," then the applicant to have leave to withdraw his application.

The 13th section treats of defective specifications, and their remedy, where the applicant, through mistake or inadvertency, had claimed "*more than he had a right to claim as new.*"

The 15th section, in enumerating the defences which a defendant may be allowed to make to a patent, states that *inter alia* he may show "that the patentee was not the original and first inventor or discoverer of the thing patented, or of a *substantial and material part thereof claimed as new*," and the proviso to the same section allows the court to refuse costs, "when the plaintiff shall fail to sustain his action on the ground that in his specification or claim is embraced *more than that of which he was the first inventor.*"

The 7th section of the act of March 3d, 1837, specially defines the meaning of the phrase *too broad* to be, when the patent claims more than that of which the patentee was the original and first inventor; and the 9th section of the same act again providing for cases where, by accident or mistake, the patentee claims more than he is justly entitled to, describes it to be, "where the patentee shall have in his specification claimed to be the original inventor or discoverer of any material or substantial part, of which he is not the first and original inventor, *and*, shall have no legal and just right to the same." Thus we see that it is only where, through inadvertence or mistake, the patentee has claimed something of which he was not the *first inventor*, the Court are directed to refuse costs.

The books of reports may be searched in vain for a case where a patent has been declared void, for being *too broad* in any other sense.

Assuming it to be true, then, for the purpose of the argument, that the new application of the power of electro-magnetism to the art of telegraphing or printing characters at a distance, is not the subject of a patent, because it is patenting a principle; yet as it is also true that Morse was the first who made this application successfully, as set forth in this 8th claim, I am unable to comprehend how, in the words of the statute, we can adjudge "that he has failed to sustain his action on the ground that his specification or claim embraces more than that of which he was the first inventor." It is for this alone that the statute authorizes us to refuse costs.

4th. Assuming this 8th claim to be too broad, it may well be said, that the patentee has not unreasonably delayed a disclaimer, when we consider that it is not till this moment he had reason to believe it was too broad. But the bill claims, and it is sustained by proof, that the defendant has infringed the complainant's second patent for his improvement.

The Court sustain the validity of this patent. Why, then, is the com-

plainant not entitled to his costs? At law, a recovery on one good count is sufficient to entitle the plaintiff to recover costs; and I can see no particular equity which the defendants can claim, who are adjudged to have pirated two inventions at once.

I am of opinion, therefore, that the decree of the Circuit Court should be affirmed, with costs.

True copy.

Test: WM. THOS. CARROLL,
C. S. C. U. S.

MECHANICS, PHYSICS, AND CHEMISTRY.

Translated for the Journal of the Franklin Institute.

Ratio of Friction to Magnetic Adhesion.

In the January number of the *Annales de Chimie et de Physique*, M. Nicklès, who has been engaged in endeavoring to introduce magnetic adhesion as an element in practical machinery, has given the results of some experiments which he has made on the ratio of the friction to the adhesion.

The electro-magnet used by him was of the kind described by M. Joule, (*Philos. Mag.* 4th Series, Vol. ii, p. 450.) The coils are composed of thirty metres of copper wire of two millimetres in cross-section: each one of the polar surfaces was 0·080 metre long and 0·02 broad. The magnet was placed vertically upon a piece of rail laid with care in a horizontal position. The surfaces were carefully cleaned and polished. A rope passing over pulleys was attached to the upper part of magnet to hold the weights used to determine the separation of the surfaces, and another cord was so arranged as to hold the weight required to produce horizontal motion. The experiments were tried both with the rail dry and wet. The following tables contain the results of the experiments; the weight of the electro-magnet (4 kil.) being added to the pressure; and 1 kil., the weight necessary to produce sliding when the bar was not magnetized, being subtracted from the proper column.

Magnetic Pressure.		Weight necessary to produce sliding.	Ratio.
Armature dry,	231 kil. 236 229	kil. kil. Mean 232+4=236	73 73 73 Mean 73—1=72 kil.	0·3.
Armature moistened	230 224	227+4=231	63 67 63 64·5—1=63·5	0·27.

After breaking the circuit, a load of 232 kil. was placed upon the magnet, which (as the magnet weighed 4 kil.) gave a total load of 236 kil. The results were as follows:

Armature dry,	Load 236 kil.:	Force to produce sliding 63.	Ratio 0·26.
" moistened,	" 236 "	" " " 59.	" 0·25.

"M. Barral obtained the number 0·31 as the expression of the ratio of friction to magnetic pressure; but as he has not given the details of his

experiments, I do not know whether the slight difference which exists between his results and mine is due to the difference of the processes employed, or to the state of the surfaces in contact. We see, by what has been said, that the moisture of the armature influences the results in either case, and in the same way.

"An accident to the apparatus prevented me from experimenting with the load and magnetic attraction together."

For the Journal of the Franklin Institute.

On the Use of Anthracite Coal in Locomotives.

Being favored with the perusal of the annexed letter, and deeming it of more than ordinary importance in this age of transition from the use of wood to anthracite coal in locomotives, I have obtained the consent of the writer for its publication.

Mr. Pardee being an eminently practical as well as scientific engineer, of long experience in the management of a highly successful coal estate, his statement of facts (not intended for the public eye) proves clearly that there is no great mystery in using anthracite coal for locomotive engines. R.

Extract of a Letter from A. PARDEE, Esq., *to* EDWARD MILLER, Esq., *Chief Engineer of the North Pennsylvania Railroad*

"The use of anthracite coal as fuel, was commenced on the Beaver Meadow Railroad, in 1836, in engines built by Eastwick & Harrison, and has been continued to the present time in a portion of their engines.

"On the Hazleton road we commenced its use in 1838, in the 'Lehigh' engine, built by Eastwick & Harrison, and in 1839 in the 'Hercules,' by same makers. Both engines have been in constant use during the season of navigation, say eight months per year, up to and including 1852, when the 'Lehigh' was taken into the shop to be rebuilt. The 'Hercules' is still in use.

"Both engines had originally copper flues, which were replaced by iron ones after about two years' use, the copper having been worn out at the end next to the fire box, by the particles of coal drawn in by the draft.

"Both engines have now the same fire boxes with which they were turned out of the maker's shop, excepting about one foot of the lower part, which has been once renewed. The iron flues now in use are those put in to replace the copper—never having been renewed either in whole or in part. Altogether, we have in use on this road eight locomotive engines, three built by Eastwick & Harrison, one by M. W. Baldwin, and four in our own shops at Hazleton.

"We have never used other fuel than anthracite coal, excepting for the purpose of kindling fires. The engines have been in use during the season of navigation from two years ago, (when the last were built,) up to the time of the oldest engines named above, and we have never renewed a fire box or set of flues, except the repairs to the two engines named. As

far, therefore, as our experience goes, anthracite coal for fuel is not so destructive to fire boxes and flues as has been generally argued and supposed. We wear out about two sets of grate bars in the season's use of an engine.

"*As to the Character of the Road.*—In starting from the Lehigh at Penn Haven, we had, while using a part of the Beaver Meadow road, an ascending grade averaging 80 feet per mile for 5 miles; then 140 feet per mile for $1\frac{3}{4}$ miles; then 60 feet for $3\frac{1}{2}$ miles, and then a grade of 12 feet per mile for $3\frac{1}{2}$ miles, to the intersection of the various branches leading to the mines. In descending, as you will perceive, mostly by gravity, the coal fire remained entirely inactive, having no artificial draft by fans or otherwise, except that caused by the exhaust steam; while in ascending with a load of empty cars, equal to the whole power of the engine, the fire to generate the necessary steam must be stimulated to the most intense activity; thus making, apparently, a far more unfavorable state of things for the use of coal than on a road where the grades are more uniform, and in consequence, the fire acted upon by a more uniform draft.

"I am aware that it has been said that coal might do for short roads, but that on long roads the continuous intense action of the heat would destroy the fire box and flues.

"Now, it strikes me as absurd to suppose that on a road of any length a fire need be made more intensely hot, or that any part of the boiler could be more heated, than is necessary to drive an engine and full train up ten miles of such grades as are specified above, or that a continuous equable heat for eight or ten hours can be worse than continuing the same heat for an hour, then a moderate fire for an hour, and so on alternately, with the consequent expansion and contraction, and this continued day after day for eight months annually during 15 years.

"I have entered into this subject, perhaps, to a somewhat tedious length, my object being to satisfy yourself and others, that anthracite coal has been used successfully for a series of years in this region as fuel for locomotive engines not differing materially from the ordinary mode of construction."

For the Journal of the Franklin Institute.

Furnaces of Locomotive Boilers. By ZERAH COLBURN.

In accordance with the principles explained in my article on the above subject, as published in the *Journal* for March, I have designed a boiler of peculiar form, with a view to its introduction upon an important line of road, largely occupied in carrying anthracite coal. The object is that of burning anthracite as a fuel. It is well known to have been the effort of all the parties, who have thus far attempted the adaptation of anthracite to locomotives, to attain to the largest practicable extent of grate surface. The objects sought in enlarging the grate are, to diffuse the action of the draft upon a larger surface of burning coal, thereby lessening the intensity of the fire at any one point; and also, by the same means, to lessen the destructive action of the intense heat upon the sides of the furnace. These objects have been generally appreciated as legitimate

grounds for enlarging the grate, and I have therefore designed my boiler with reference to their attainment.

The boiler referred to has its furnace (rectangular in plan,) placed entirely behind and clear of the driving wheels. The walls of the fire-box, instead of descending perpendicularly from the barrel of the boiler, are inclined outwards sufficiently to give a width of grate as much as the objects contiguous to the track will permit. In the case under notice, the grate, for a gauge of six feet, is *nine feet and six inches* in width. A water bridge, however, of three or four inches width, would probably be run across the furnace in the direction of the length of the engine. With a length, fore and aft, of four feet, which would be extremely convenient for firing, this would allow of 37 square feet of grate area, nearly 50 per cent. more than in the Baltimore built engines.

As this form of furnace requires to be wholly behind the fire box, it might throw the engine considerably out of balance, unless properly lengthened towards the forward end. To lengthen the boiler, however, would increase the friction surface, and consequently the back pressure, in the tubes, thereby requiring an increased action of the blast. But by suitably enlarging the diameter of the tubes, the absolute flue opening is not only made greater, but is made much greater *in proportion* to the friction surface. In the boiler under notice, with a diameter of 51 inches, there are to be 109 tubes, 3 inches in diameter and 16 feet long. The heating surface will therefore stand as follows:

1370	square feet	tube surface.	
103¾	"	"	fire-box "
37	"	"	grate "

This gives one square foot of grate to every 40 feet of heating surface.

As the furnace is very shallow, the heat generated on the grate is received directly upon the crown sheet, from whence it is communicated to the water with less injury to the furnace than if acting upon a deep side sheet.

Some general notes of the engine may be interesting. It is expected to take a load of 300 tons up a grade of 75 feet rise per mile; hence it is planned for considerable power. Inasmuch, also, as the superstructure of the road is of a rail weighing 75 pounds per yard, upon sleepers only 18 inches between centres, it has been determined to place the entire weight of the engine on but six wheels. The dimensions are, therefore, as follows:

Cylinders 20 inches diameter; 24 inches stroke; six drivers, 48 inches in diameter; wheels 12 feet between extreme centres; centres of cylinders (across engine) 8 feet 2 inches apart; boiler 51 inches interior diameter, containing 109 tubes, 3 inches in diameter, and 16 feet long; furnace 4 feet long, 9 feet 6 inches wide, 3 feet 10 inches deep at centre, 12 inches deep at sides; steam ports 14 by 1¾ inches; valves of my improved kind, giving a double admission and a double exhaust of steam. Whole weight of engine in running order, estimated at 70,000 pounds.

I am induced to hope, from the adoption of a form of boiler such as I have described, for improved results in burning anthracite coal. By my arrangement, the whole fire is under the reach of the fireman's shovel,

while the entire surface of the grate is nearer the tube openings than by any other plan. Every one engaged in constructing locomotives, will admit that there has been a greater tendency, and, indeed, a greater opportunity, to increase the tube surface than the grate area of locomotive boilers. The difficulty of burning coal upon a small grate has led to its enlargement by longitudinal extension, so that grates of seven feet length are now quite common upon locomotives burning coal. The width of such grates is, however, but three and a half feet, and there is no chance for firing, except on the top, through which the coal is *dumped* in a stack upon the grate. It is very difficult to keep the grates free from cinder, where they are of such length, and consequently they are more apt to become burnt out.

I should propose that in all locomotive boilers, the lower and side tubes be from $\frac{1}{4}$ to $\frac{1}{2}$ inch larger than the others. The draft is strongest at the centre and top of the body of tubes; hence, if the outer and lower tubes are of greater size than the others, more heat will be taken up in them, as the draft will be made easier.

I find that a reaction in regard to the size of tubes is going on in locomotive building. All of the most successful builders are adopting 2 inch, and in some cases $2\frac{1}{4}$, and even $2\frac{1}{2}$ inch tubes, in place of $1\frac{3}{4}$ inch tubes, which have been generally used for some years past. Even with a diminished surface, consequent upon increased diameter, the ability of the boiler to make steam under a given strength of blast, is found to be increased. The grounds upon which this increase has been made, were amply stated in the *Journal* for March.

Electric Induction—Associated Cases of Current and Static Effects. By Professor FARADAY.*

Professor Faraday began the season as usual, this place of honor being now generally conceded to him; and upon his favorite subject, it is no wonder that a very numerous assembly came to hear him descant upon "Electric Induction—Associated Cases of Current and Static Effects." It is very singular to notice how new arrangements of well known substances and instruments generate new classes of facts; and it is still more remarkable how the scientific observer stands ready on the watch to catch hold of such facts, and make the most of them. The land electric telegraph was one thing. It turns out that the submarine telegraph is another, just as a plain copper wire passing through the air is productive of certain phenomena when subjected to electric influence, while such a wire coated with gutta percha exhibits still more extraordinary phenomena. The lecturer stated that he had, by means of the great machine employed by the Electric Telegraph Company, proved the truthfulness of the view which he had put forth sixteen years ago (*Experimental Researches*, 1318, &c.), respecting the unusually dependent nature of induction, conduction, and insulation. He had been enabled to experiment with 100 miles of wire. When the wire in the air was experimented upon, not the slightest sign of any of certain effects

* From the London Practical Mechanic's Journal, March, 1854.

upon the galvanometer was produced; with the water wire the action was made evident, yet the wire was equally well and better insulated, and as regarded a constant current, it was an equally good conductor. In consequence of the very accurate manner in which the wire is covered with the gutta percha, a Leyden arrangement is produced upon a grand scale; the copper wire becomes charged statically with that electricity which the pole of the battery connected with it can supply (*Davy, Elements of Chemical Philosophy*, p. 154); it acts by induction through the gutta percha, producing the opposite state on the surface of the water touching the gutta percha, which forms the outer coating of this curious arrangement. The gutta percha across which the induction occurs is only 0·1 of an inch thick, and the extent of the coating is enormous. The surface of the copper wire is nearly 8300 square feet, and the surface of the outer coating of water is four times that amount, or 33,000 square feet. Hence the striking character of the results—results which the best ordinary electric machines and Leyden arrangements cannot as yet approach. The phenomena offer a beautiful case of the identity of static and dynamic electricity, the whole power of a considerable battery being made capable of being worked off in separate portions, and measured out in units of static force, and yet be employed afterwards for any or every purpose of voltaic electricity. The Professor then proceeded to further consequences of associated static and dynamic effects, showing by experimental demonstration many very striking, such as a current of electricity flowing on to the end of the wire, whilst there was none flowing in at the beginning—currents flowing out at both extremities of the wire in opposite directions, whilst no current is going into it from any source—a current first entering into the wire, and then returning out of the wire at the same place. When an iron wire of equal extent is experimented with in like manner, no such effects as these are perceived, proving that, in the former case, time is exactly appreciable. All these results as to time depend upon lateral induction. Admitting that such and similar experiments show that conduction through a wire is preceded by the act of induction, then all these singular phenomena are explained. Mr. Wheatstone had, in 1834, measured the velocity of a wave of electricity through a copper wire, and given it as 288,000 miles in a second. Professor Faraday had, in 1838, shown how it was possible for this to be retarded, and now, with 1500 miles of subterraneous wire, the wave was two seconds in passing from end to end; whilst, with the same length of air wire, the time was almost inappreciable. With these lights, it is interesting to look at the measured velocities of electricity in wires of metal as given by different experimenters:—

	Miles per Second.
Wheatstone, in 1834, with copper wire, made it .	288,000
Walker, in America, with telegraph iron wire, . .	18,780
Mitchell, do do do .	28,524
Fizeau and Gonnelle, copper wire, . . .	112,680
Do. iron wire, . . .	62,600
A. B. G. (*Athenæum*, Jan. 14), copper (Lon. & Bruss. Tel.),	2,700
Do. do. do. do. (Lon. & Edin. Tel.),	7,600

The Professor remarked, that although these effects are so, the conducting power of the air and water wires are alike for a constant current.

Mr. Clarke arranged a Bain's printing telegraph with three pens, so that it gave beautiful illustrations and records of facts like those stated. The pens are iron wires, under which a band of paper, imbued with ferro-prussiate of potassa, passes at a regular rate by clockwork, and thus regular lines of prussian blue are produced whenever a current is transmitted, and the line of the current is recorded.

In the course of the evening, Professor Faraday explained the operation of the Statham fuze, which is of the following nature:—Some copper wire was covered with sulphuretted gutta percha; after some months, it was found that a fibre of sulphuret of copper was formed between the metal and the envelope; and further, that when half the gutta percha was cut away in any place, and then the copper wire removed for about one-fourth of an inch, so as to remain connected only by the film of sulphuret adhering to the remaining gutta percha, an intensity battery could cause this sulphuret to enter into vivid ignition, and fire gunpowder with the utmost ease. The experiment was shown of firing gunpowder at the end of eight miles of single wire, and Mr. Faraday stated that he had seen it fired through 100 miles of covered wire immersed in a canal, by the use of this fuze.

For the Journal of the Franklin Institute.

Remarks on the Caloric Ship Ericsson.

The Ericsson having recently been sunk during a trial trip in the harbor of New York, considerable anxiety was manifested by the leading papers of that city at the possibility of her total loss. Their minds were much relieved by the following letter, sent to them for publication, and by which they are assured that as soon as the vessel is again in order, they shall have their promised trial trip; when, it is to be hoped, some of the gentlemen will be able to give a correct account, more consistent with the facts of the case than their report of the celebrated trial trip which finished the days of steam in the winter of 1852.

To the Editor of the New York Tribune.

Sir:—The serious accident to the "Caloric Ship," last Thursday, has deprived me of the anticipated pleasure of inviting you to witness the performance of the new machinery of this ship. Previous to the untoward occurrence, Mr. Kitching had cheerfully acceded to my proposition of making a formal trial trip, this week, to afford the New York Press an opportunity of witnessing the practical operation of the new machinery, and of hearing my explanation of the important changes which have been made in regard to that motive power, which, a year ago, was heralded to the world by the distinguished press of New York, in a manner altogether unprecedented in the history of mechanical progress.

As soon as the ship and machinery are again in serviceable condition, I shall not lose a moment in performing the agreeable task of rendering the proposed account of the invention. In the meantime, I have to state, that when the noble ship went down, the motive power had proved *completely successful.* The engines had not been put to any thing like maximum work, and yet we attained a speed of more than *eleven* miles an hour, with a consumption of fuel which promises to render ocean navigation, in point of economy, what it has already proved in point of celerity.

I am, very respectfully, your obd't. ser't.,

New York, May 2, 1854. J. Ericsson.

The letter of Captain Ericsson is worthy of being placed on record, as showing to what an extent inventors (or those who fancy themselves such) may be carried away with their inventions.

It will be remembered that the *Ericsson* first started with four cylinders of 14 feet diameter, 6 feet stroke, single acting, and the size of the cylinders furnished the substance of many a newspaper article. With those cylinders she made two trials in New York harbor, and one to Washington City, when, from the report of Captains Sands and Ericsson, her large pistons enabled her to maintain an unusual regularity of motion. On her return from Washington, the machinery was all very quietly taken out, and a new set put in, having two cylinders of about 6 feet diameter, 6 feet stroke, double acting; and one of those *expensive* machines, a steam engine and boiler, was actually put on board, to assist in time of need its more powerful brother.

After months of preparation and weeks of tinkering at the packing, a trial trip was commenced, and Staten Island, a distance of seven miles, reached in safety. There the trip was abandoned, and she returned to New York; and then, to my mind, commenced the triumph of genius. Immediately, three steam boilers were ordered and put on board. (I say steam boilers, for they are what is ordinarily built for such, and are used on board the *Ericsson* with water inside and fire in the furnaces.) But you will observe from Captain Ericsson's letter, that he is now using the same motive power that the Press of New York heralded to the world a year since, in a manner unprecedented in the history of mechanical progress.

Is it not a triumph of genius, for a man who has entirely changed his ground still to be able to flatter himself that he is just where he started in principle, but has only been improving his machinery? One more failure, (which is near at hand,) and the old fashioned steam engine will be used, and possibly claimed as a new improvement.

Seriously, however, the *Ericsson* is a most lamentable failure, not yet finished; for the present machinery can never answer a practical use. When the end is reached, I hope that capitalists will cause to be investigated all new inventions that promise large gains, before they allow themselves to be induced to throw away their share of the capital of the country in unproductive and visionary schemes, which only need a practical test on a *moderate* scale to prove their want of merit.

FULTON.

On Electro-Dynamic Induction in Liquids. By Professor FARADAY, F. R. S., &c.*

To Prof. Aug. de la Rive, For. Mem. R. S., &c.

Your question, "whether I have ever succeeded in producing induction currents in other liquids than mercury or melted metals, as, for instance, in acid or saline solutions?" has led me to make a few experiments on the subject; for though I believed in the possibility of such currents, I had never obtained affirmative results: I have now procured them, and send you a description of the method pursued. A powerful electro-magnet of the horse-shoe form was associated with a Grove's battery of twenty pairs of plates. The poles of the magnet were upwards,

* From the London, Edinburgh, and Dublin Philos. Magazine, April, 1854.

their flat end faces being in the same horizontal plane; they are 3·5 inches square and above 6 inches apart. A cylindrical bar of soft iron, 8 inches long and 1·7 inch diameter, was employed as a keeper or sub-magnet: the cylindrical form was adopted, first, because it best allowed of the formation of a fluid helix around it; and next, because when placed on the poles of the magnet, and the battery connexions made and broken, the magnet and also the keeper rises and falls through much larger variations of power, and far more rapidly than when a square or flat-faced keeper is employed; for the latter, if massive, has, as you know, the power of sustaining the magnetic conditions of the magnet in a very great degree when the battery connexion is broken. A fluid helix was formed round this keeper, having 12 convolutions and a total length of 7 feet; the fluid was only 0·25 of an inch in diameter, the object being to obtain a certain amount of intensity in the current by making the inductive excitement extend to all parts of that great length, rather than to produce a quantity current by largeness of diameter, *i. e.* by a shorter mass of fluid. This helix was easily constructed by the use of 8·5 feet of vulcanized caoutchouc tube, having an internal diameter of 0·25, and an external diameter of 0·5 of an inch: such a tube is sufficiently strong not to collapse when placed round the iron cylinder. The twelve convolutions occupied the interval of 6 inches, and two lengths of 9 inches each constituted the ends. This helix was easily and perfectly filled by holding it with its axes perpendicular, dipping the lower end into the fluid to be used, and withdrawing the air at the upper; then two long, clean, copper wires, 0·25 of an inch in diameter, were introduced at the ends, and being thrust forward until they reached the helix, were made secure by ligaments, and thus formed conductors between the fluid helix and the galvanometer: the whole was attached to a wooden frame so as to protect the helix from pressure or derangement when moved to and fro. The quantity of fluid contained in the helix was about 3 cubic inches in the length of 7 feet. The galvanometer was of copper wire, $\frac{1}{30}$th of an inch in diameter and 164 feet in length, occupying 310 convolutions; it was 18 feet from the magnet, and connected with the helix by thick wires dipping into cups of mercury. It was in the same horizontal plane with the magnetic poles, and very little affected by direct action from the latter.

A solution formed by mixing one volume of strong sulphuric acid and three of water was introduced into the helix tube, the iron keeper placed on the helix, and the whole adjusted on the magnetic poles in such a position, that the ends of the copper connectors in the tube were above the iron cylinder or keeper, and were advanced so far over it as to reach the perpendicular plane passing through its axis: in this position the lines of magnetic force had no tendency to excite an induced current through the metallic parts of the communication. The outer ends of the copper terminals were well connected together and the whole left for a time, so that any voltaic tendency due to the contact of the acid and copper might be diminished or exhausted: after that, the copper ends were separated, and the connexions with the galvanometer so adjusted, that they could be in an instant either interrupted, or completed, or crossed at the mercury cups. Being interrupted, the magnet was excited by the full force

of the battery, and then the *direct* magnetic effect on the galvanometer was observed: the helix had been so arranged that any current induced in it should give a deflexion in the contrary direction to that thus caused directly by the magnet, that the two effects might be the better separated. The battery was then disconnected, and when the reverse action was over, the galvanometer connexions were completed with the helix; this caused a deflexion of only 2°, due to a voltaic current generated by the action of the acid in the helix on the copper ends: it showed that the connexion throughout was good; and being constant in power, caused a steady deflexion, and was thus easily distinguished from the final result. Lastly, the battery was thrown into action upon the magnet, and immediately the galvanometer was deflected in one direction, and upon breaking battery contact it was deflected in the other direction, so that by a few alternations considerable swing could be imparted to the needles. They moved also in that particular manner often observed with induced currents, as if urged by an impact or push at the moment when the magnet was excited or lowered in force; and the motion was in the *reverse* direction to that produced by the mere direct action of the magnet. The effects were constant; when the communicating wires were crossed they again occurred, giving reverse actions at the galvanometer. Further proof that they were due to currents induced in the fluid helix was obtained by arranging one turn of a copper wire round the iron core or keeper in the same direction as that of the fluid helix, and using one pair of plates to excite the magnet; the induced current caused in the copper wire was much stronger than that obtained with the fluid, but it was always in the same direction.

After these experiments with the highly conducting solution, the helix was removed, the dilute acid poured out, a stream of water sent through the helix for some time, distilled water then introduced and allowed to remain in it a while, which being replaced by fresh distilled water, all things were restored to their places as before, and thus a helix of pure water submitted to experiment. The direct action of the magnet was the same as in the first instance, but there was no appearance of a voltaic current when the galvanometer communications were completed; nor were there any signs of an induced current upon throwing the magnet into and out of action. Pure water is too bad a conductor to give any sensible effects with a galvanometer and magnet of this sensibility and power.

I then dismissed the helix, but, placing the keeper on the magnetic poles, arranged a glass dish under it and filled the dish with the same acid solution as before; so that the liquid formed a horizontal fluid disk 6 inches in diameter nearly, an inch deep, and within 0·25 of an inch of the keeper; two long, clean, platina plates dipped into this acid on each side of the keeper and parallel to it, and were at least 5 inches apart from each other; these were first connected together for a time that any voltaic tendency might subside, and then arranged so as to be united with the galvanometer when requisite, as before. Here the induced currents were obtained as in the first instance, but not with the same degree of strength. Their direction was compared with that of the current induced in a single copper wire passed between the fluid and the

keeper, the magnet being then excited by one cell, and was found to be the same. However, here the possibility exists of the current being in part or altogether excited upon the portions of the wire conductors connected with the platinum plates; for as their ends tend to go beneath the keeper, and so *into* the circuit of magnetic power formed by it and the magnet, they are subject to the lines of force in such a position as to have the induced current formed in them; and the induced current can obtain power enough to go through liquid, as I showed in 1831. But as the helix experiment is free from this objection, I do not doubt that a weak induced current occurred in the fluid in the dish also.

So I consider the excitement of induction currents in liquids not metallic as proved; and as far as I can judge, they are proportionate in strength to the conducting power of the body in which they are generated. In the dilute sulphuric acid they were of course stronger than they appeared by the deflexion to be, because they had first to overcome the contrary deflexion which the direct action of the magnet was able to produce; the sum of the two deflexions, in fact, expressed the force of the induced current. Whether the conduction by virtue of which they occur is electrolytic in character or conduction proper, I cannot say. The present phenomena do not aid to settle that question, because the induced current may exist by either the one or the other process. I believe that conduction proper exists, and that a very weak induction current may pass altogether by it, exerting for the time only a tendency to electrolysis, whilst a stronger current may pass, partly by it and partly by full electrolytic action.—*Bibliothèque Universelle de Genève.*

Royal Institution, March 7, 1854.

On the Spheroidal State of Water in Steam-boilers. By A. Normandy, Esq.*

To Dr. Tyndall, F. R. S., &c.

Convinced as I am that water frequently assumes the spheroidal state in boilers, in consequence of which these most important vessels, on which the very existence of the steam engine, that is, of most of the comforts of civilized life, depend, are too often converted by mismanagement or ignorance into frightful engines of death and destruction, I venture now to trouble you with a few observations in addition to those which you were kind enough to listen to the other day, in the hope that, should the facts which I am about to relate appear to you as conclusive as they do to me, you may be induced, in your lectures on heat, to call once more the attention of the audience, should you deem fit to do so, to this, I believe, fruitful but almost unsuspected, or at any rate scarcely credited source of explosion.

I have already had the honor to relate to you that I had seen the plates of a Cornish boiler, a quarter of an inch thick, become red hot in the flue, although at the time the boiler contained its due quantity of water. It was a new boiler, about 18 feet long; and that the water had assumed therein the spheroidal state is proved by the fact, that a lead rivet, 1 inch

*From the Lond., Edinb., and Dublin Philosoph. Magazine, April, 1854.

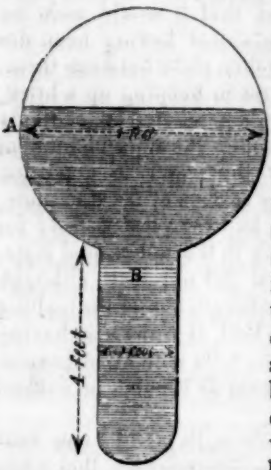
in diameter, put in for safety, was actually melted. It is, in fact, this rivet which led to the detection of the cause of the occurrence, and an investigation of the subject brought out the following details. The fireman or stoker was an ignorant mulatto, who having noticed the lead rivet in the boiler, had given it as his opinion that it would soon be melted by the fire; the possibility of such an accident having been denied by one of his fellow workmen, a bet had taken place between them. The wager having thus been laid, the fireman set to keeping up a brisk, bright fire; in consequence of which, steam being generated exceedingly fast, *priming*, that is, a production of steam under the superincumbent water, took place, and, as a matter of course, the water, or a portion thereof, not being any longer in contact with the surface of the iron plate, the latter in a very short time became red-hot, and *the rivet melted;* for some time afterwards, however, the water being in the spheroidal state, the boiler remained apparently sound, that is, it did not leak, although it had an opening of an inch diameter left in consequence of the melting of the rivet; it is only shortly afterwards I was told, that the heat having diminished, torrents of water poured through the hole with almost explosive violence, emitting volumes of scalding steam as it came in contact with the fire on the grate.

This took place at the Wenlock Timber Saw-mills; and I can bear testimony to the above fact, and likewise to this circumstance, that when filled as usual with its normal quantity of water, the bottom of the boiler over the fire could, in the course of five or six minutes, be made red-hot at pleasure by brisk firing. In fact, having called at the above works, according to appointment, to meet the engineer there, my inquiry as to the then state of the boiler was answered by the foreman, in presence of his master, in these words:—"*The boiler is not red-hot now, but if you will step this way it will be made so immediately;*" and in spite of all remonstrance as to the danger of such an experiment, he came shortly afterwards to announce that the boiler was red-hot, and *I saw it* in that state in presence of the engineer, the master, his nephew, the foreman, and the fireman or stoker. The production of steam had been thereby spontaneously reduced, the bolt or lead rivet eventually melted, but not in my presence; for seeing the state of things, I speedily retreated with the engineer and the master, but almost reluctantly followed by the foreman, in whose somewhat jeering looks I could plainly read that he entertained but a poor idea of our pluck.

In addition to this, I may say that in "wagon boilers," a shape than which none can be more unsafe, but which is now fortunately much less in use than in former years, bulging bumps are very often observed, which are certainly due to the pressure of the steam in the boiler upon the iron plates of the bottom, when by extravagant or incautious firing they have been made red-hot. Frequently, however, instead of bulgings or bumps being thus produced, a disruption of the boiler takes place, attended with more or less fatal consequences. Many such accidents have thus happened at Manchester, and particularly on Monday mornings.

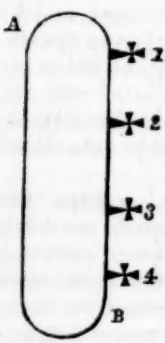
The following occurrence, related to me by my friend Mr. A. M. Perkins as having taken place *in his presence* in a boiler of a peculiar construction in which steam was generated by means of his hot-water pipes,

is also well worth mentioning, as I think we may gather from it a correct explanation of the facts under consideration; and the rough sketch below, which represents a cross section of the boiler, will perhaps explain the matter better than I could do by writing.



The boiler had the dimensions indicated, and was 8 feet in length; it was filled with water to about A as usual, the safety valve had an area of 4 inches. From such a boiler the whole of the water was completely driven off through the valve by violent *priming;* that is to say, steam was generated so fast by a hot water pipe in the limb B, that it completely lifted up the water and violently squirted it out of the boiler, as just related. In such a case, the water being heated by pipes, and not by contact with the heated surfaces of the boiler, no other mischief could result than that of priming: but suppose, on the contrary, such a boiler to have been heated in the usual manner; there is no doubt that the steam generated in the limb B would, by lifting the superincumbent water, have soon permitted that part of the boiler to become red-hot, and thus have procured the curious phenomenon *revived* and *studied* by Boutigny d'Evreux, and named by him a fourth or spheroidal condition of matter, but to which, so far as refers to water, the late Jacob Perkins had, to my certain knowledge, called the attention of engineers and of savans more than twenty-five years ago, (in fact, as far back as 1824.)

Allow me to relate also the curious experiment of a distinguished civil engineer, Mr. Alexander Gordon, made several years ago, as related to me by Mr. A. M. Perkins. A B is a cylinder provided with four try-cocks, 1, 2, 3, 4; water being introduced into the cylinder and heated therein, the cocks on being successively turned gave the following results; namely, steam issuing from 1, 2, 3, and water from 4; but after urging the fire, the above order was found to be completely reversed; that is to say, cock No. 1 emitted water, and cocks Nos. 2, 3, 4 steam.



These facts, in my humble judgment, appear to me to prove in a decided manner,—

1. That the heating of surfaces previous to the introduction of water is not necessary to produce the spheroidal state.

2. That many boiler explosions may be referable to that condition.

3. That all boilers which offer an extensive surface to the heat, that is to say, all boilers with internal flues, are pre-eminently liable to explosions from this cause.

Earthy deposits in all kinds of boilers are favorable to the production of this dangerous phenomenon.

I cannot terminate this informal letter without apologizing for having so long trespassed on your valuable time and patience; but if a collection of facts be essential to the progress of science, I hope that you will indulgently receive this communication.

67 *Judd Street, Brunswick Square, March* 20, 1854.

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*Moison's Pendulous and Rotary Governors.**

The two classes of "Pendulous and Rotary Governors" of M. Moison, are ingenious combinations of regulating apparatus on a principle quite distinct from anything hitherto adopted in this country. The inventor's pendulous governor is represented in front elevation in fig. 1, and in vertical transverse section in fig. 2. In bearings in the rectangular open framing, A, are supported two short horizontal spindles, B C, the former having keyed upon it a pulley, by means of which it receives motion from the prime mover, and the latter carrying an escapement wheel, D,

Fig. 1.

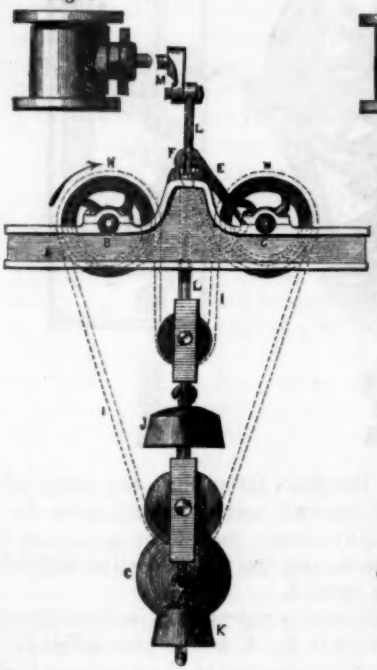
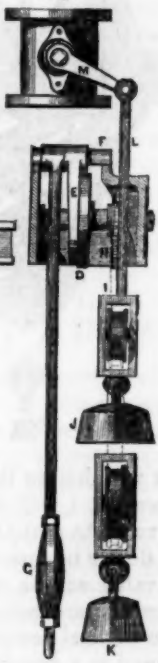


Fig. 2.

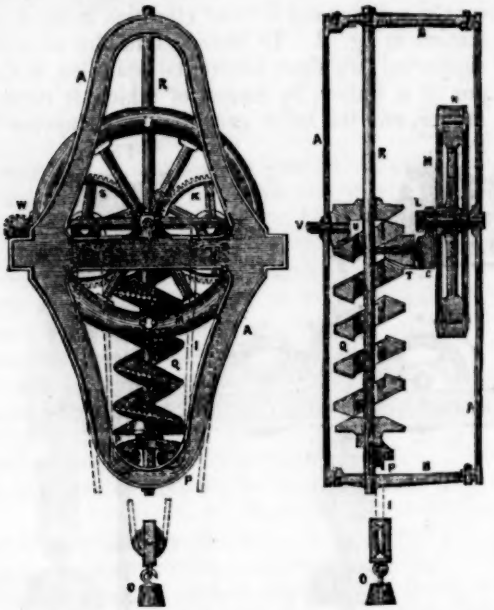


of simple construction. This last is acted upon by the escapement arms, E, keyed upon the short spindle, F, which vibrates upon knife edges, in obedience to the pendulum, G, also keyed upon it. The spindles, B C, carry toothed wheels, H H′, and over these wheels is passed an endless

* From the London Practical Mechanic's Journal, April, 1854.

pitch chain, I, to which are suspended the two weights, J K, by means of anti-friction pulleys. The weight, J, is suspended to a portion of the endless chain, I, which hangs down between the two wheels, H H′, and is connected by the rod, L, to the lever, M, of the throttle valve; the other weight, K, serves to keep the endless chain stretched. The wheel, H, is made to revolve at a uniform rate by the action of the pendulous escapement, the various parts and connexions being so proportioned that this rate shall correspond to the rate at which it is wished to maintain the machinery. The maintaining power for the escapement is derived from the wheel, H, by means of the endless chain, I. The wheel, H, revolves in the direction of the arrow, so that, if it goes at a quicker rate than the

Fig. 3. Fig. 4.

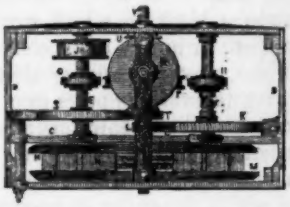


wheel, H′, it will deliver the chain faster than the latter will take it up, so that the weight, J, will descend, and by pulling down the rod, L, cause the throttle valve to partially close; and if the motion of the wheel, H, is rendered slower by any means, the reverse action will take place, and the throttle valve will be opened.

M. Moison's rotary governor is represented in front elevation in fig. 3, in transverse vertical section in fig. 4, and in plan in fig. 5. The apparatus is contained in a framing consisting of the front and back standards, A, and the top and bottom tie plates, B. There is also a central horizontal bar, C, serving to support portions of the mechanism, and which bar is cast in one piece, with two lateral cross bars, D, fitted to the front and back standards. Upon two spindles, E F, turning in bearings in the back frame, A, and central bar, C, are keyed the toothed wheels, G H, over

which passes the endless pitch chain, I. On the spindle, E, is keyed a pulley, J, by means of which motion is communicated to the mechanism from the prime mover to be regulated. On the spindle, F, is keyed a spur-wheel, K, in gear with a pinion, L, fast on a short spindle turning in bearings in the central frame-piece, C, and front frame-piece, A. The last-mentioned spindle carries a fly or vane wheel, M, fitted with a number of blades, N, set on pivots. These blades are acted upon by springs, so as to have a tendency to maintain a tangential position, in which they meet with the least atmospheric resistance in revolving. They are so poised, however, that the centrifugal force due to the revolution of the wheel will cause them to assume various inclinations according to the velocity. The arrangement is such, that, at the regular working rate, they are inclined midway between a tangential and a radial position, so that, if the velocity increases, they become more nearly radial, and cause a greater atmospheric resistance; and if the velocity diminishes, the reverse takes place, and by their becoming more nearly tangential, they reduce that resistance. In this manner the rate of the wheel, M, is never altered to the full extent of any change in the rate of the prime mover, so that, when such change of rate takes place, an inequality is occasioned in the velocity of the wheels, G and H, and the former delivers either more or less of the chain than is taken up by the latter, so that the portion of chain hanging down between the two wheels is increased or diminished according as the rate of the prime mover is accelerated or retarded. This regulating movement may be communicated to the throttle valve of a steam engine, in the same manner as in the governor already described. In figs. 3, 4, and 5, however, a different arrangement is shown, and one which is designed to act upon the sluice-gate of a hydraulic prime mover, where considerable altering power is required.

Fig. 5.



The outer portion of the endless chain, I, is kept stretched by the weight, O, as in the previous arrangement; but instead of the weight, which is suspended to the inside portion of the chain, and is directly connected to the lever of the throttle valve in that arrangement, this inside portion of the chain passes round two pulleys, P, in a bracket acting as a support to the toothed and duplex bevel helix, Q. This helix revolves upon the vertical shaft, R, fixed to the top and bottom tie plates, B, of the framing; the pulleys, P, however, and their bracket, are prevented from turning on the shaft, R, by means of a groove and feather, whilst the helix and pulleys can rise and fall on the shaft, being in fact suspended in the endless chain, I. Upon the spindle, E, is keyed a spur wheel, S, in gear with a pinion, T, carried loosely on a stud pin in the central bar, C. This pinion, T, is cast in one piece, with a bevel wheel lying within the range of the toothed helix, Q. The bevel wheel, T, is of such a size as to be just clear between the under side of one convolution and the upper side of the next lower convolution of the helix. It follows, from this arrangement, that, on the slightest up or downward movement of the helix, Q, due to the increase or diminution in length of the portion of the endless chain by which it is supported, consequent on any altera-

tion in the rate of the prime mover, as already explained, this helix will come into gear either with the top or bottom side of the bevel wheel, T; and as this wheel is constantly revolving, it will cause the helix to revolve in one direction or other, as the case may be. This rotary movement the helix communicates to a bevel wheel, U, on the opposite side of the helix to the bevel wheel, T. This last-mentioned bevel wheel is fast upon a shaft, V, which works the sluice gate by means of a rack and pinion, or in any other convenient way. Thus, the actual power of the prime mover opens or shuts the valve, the governor simply serving to bring the various parts into gear when any alteration is called for. This last described contrivance is obviously applicable to the pendulum governor previously described. The pinion, S, gears with a pinion, W, on a short spindle, with a squared end to receive a winch handle, by means of which the sluice is opened sufficiently to start the apparatus; and the vane wheel, M, is fitted on its spindle with a ratchet wheel and spring pawl, so as not to affect the revolution of the spindle whilst the machinery is being started. When the helix is in the position represented, the sluice will be quite shut, and, on the machinery being set in motion, it will rise and open the sluice more and more, until the desired speed is attained.

Prevention of Smoke and Economy of Fuel practically proved. By Mr. J. J. Stevens, Assoc. I. C. E.

[Extract of Report to the Board of Health.]

"The patent of Mr. John Lee Stevens (who I should observe is no relative of mine), appears to meet the case in a manner that is more in accordance with the opinions I have entertained than any other I have seen; in so much as it is extremely simple in its details, is consequently inexpensive as regards the first cost, requires no motive power to work it as in the case of Juckes' plan, also of Hazeldine's, and Samuel Hall's; and hence it is applicable to every description of furnace, and even to bakers' ovens.

"The operation is as follows:—At the far end of the furnace is placed a supplementary bearing bar, under which, at a few inches from the upper fire bars, is a small grating, upon which a portion of incandescent fuel falls from the furnace beyond the supplemental bearing bar; and at the end of the furnace there is an opening in which is placed two plates, protruding into the furnace, with an opening between them for the admission of air. The oxygen of the atmosphere passing through the ash-pit, over the grid plate, and between the two caloric plates, becomes heated, and in that state comes into contact with gases passing off from the body of the furnace, and so combining with the carburetted hydrogen, ignition is produced, and the flame carried along the flues in place of the black smoke.

"To convey my observations to you more fully I send you a copy of my notes as taken at several of the manufactories I have visited, viz.:—

Mr. J. C. Preller, patent leather manufactory, Lant street, Borough.

"Boiler 12 feet × 4 feet, with internal flue; coals used, Midland and Newcastle; consumption, 2½ tons per week. I had the furnace charged

* From the London Mining Journal, No. 964.

with coals in the usual way, and observed the top of chimney; saw brown semi-opaque smoke during the time the furnace door was open. As soon as the door was closed the brown smoke immediately became transparent. I then had the coals raked up, and a further supply thrown on, but found the stoker *could not* produce black opaque smoke. The engineer stated that the saving in coals, the additional work now performed by the engine considered, was about one-third; that they were compelled, with the old furnace, to resort to Welsh coals (anthracite), as the volume of black smoke with Midland or Newcastle coals then caused great complaints in the neighborhood; and that the cost of Welsh coals compared with the Midland, and considering the saving above referred to, between the old and new furnaces with Midland coals, made an advantage to the proprietor of more than 40 per cent."

Messrs. Easton and Amos, engineers, Grove street, Guilford street, Southwark. "Boiler 18 feet × 6 feet, with J. Lee Stevens's furnace, and boiler 14 feet × 5 feet, Juckes's furnace; consumption of coals, nothing but slack being used, about 2½ tons per day; the flues of the two furnaces conducted into one shaft; and the first mentioned furnace fed with coals about six times per hour. Brown semi-opaque smoke emitted 1½ minutes after coaling; light brown, nearly transparent, for another minute; and afterwards only a thin vapor, slightly tinged, not so much as from an ordinary house fire. With Juckes's patent the fire has to be drawn back about twice in each hour, during which time semi-opaque smoke is emitted for two minutes. The working of these two plans in juxta-position is very satisfactory as regards the merits of each of them. The stoker states that he gets up the steam to the required pressure with much greater facilities since he has had Mr. Lee Stevens's arrangement of furnace. Before its introduction, dense black smoke was emitted from the chimney for 40 minutes out of every 60."

Mr. Sisterson, engineer, Bridge street, Southwark. "A very small boiler and furnace. Boiler 6 feet 6 inches × 3 feet 9 inches; consumption 2 cwts. per day. When Mr. Lee Stevens's smoke-consuming apparatus was applied, the furnace was contracted, and the saving of coals is one-third: formerly the dense black smoke was very much complained of; but since the adoption of the new plan there is no cause for complaints; and the fireman stated that they got up steam with greater facility, and that, combined with the saving in coals, would render a return to the old principle a loss to them."

Messrs. Keens and Welch, Mustard Mills, Garlick hill, City. "Having complaints from their neighbors of the volumes of black smoke emitted from the engine-chimney, and having been served with a notice from the authorities in the City to abate the nuisance, they had adopted Mr. Lee Stevens's furnaces. Boiler 13 feet × 5 feet 6 inches; saving of fuel $\frac{1}{12}$th; the fire surface unusually large. Had previously an ordinary furnace, charged four times per hour; dense black smoke emitted for 10 minutes after firing, 40 minutes per hour. With the new plan, charge four times per hour; brown semi-opaque smoke emitted 1½ minutes, or 6 minutes per hour. The engineer states that he has had less difficulty in getting up the steam; that he has recommended the proprietors to have

the furnace of the second boiler altered so as to consume the smoke; and that it would be a loss to them to return to the old plan."

At another of Messrs. Keens and Welch, Trinity lane, City. "The stoker reported the saving of fuel was one-fifth, and that with this smoke-consuming apparatus he can get up the steam in less time than before. There was no smoke perceptible from the top of the chimney, except when the furnace door was open, and then not black, but brown semi-opaque. Previous to the adoption of Mr. Lee Stevens's apparatus there were great complaints in the neighborhood of the smoke from this chimney."

Messrs. Miller, Ravenhill, and Salkeld, engineers and marine steam engine manufacturers, Glasshouse field, Stepney. "Boiler 11 feet × 4 feet; consumption of coals 8¾ cwts. in 12 hours. With old furnace they charged every 10 minutes, which gave thick black smoke for five minutes, and then brown smoke for the remaining five minutes. With Mr. Lee Stevens's plan, charged the furnace every quarter of an hour, the smoke being without color as soon as the furnace door was closed. The result of a continuous use of the invention, as regards consumption of coal, was—Old plan, 3½ tons, consumed in 7 days 2 hours; new plan, 3½ tons, consumed in 8 days 5½ hours; estimated saving about a sixth. As this eminent firm had been mainly desirous of testing the value of Mr. Lee Stevens's invention as regards the saving of fuel, they gave me the opportunity of trying an experiment in reference to the consumption of smoke, which was as follows: The hot-air passage at the end of the ash-pit, and through which the air is admitted into the back of the furnace, between the caloric plates before described, I had stopped with clay; by which means the furnace was temporarily restored to the ordinary or old plan, the result of which was the production of a large volume of thick black smoke, nearly continuous; but on the removal of the clay the black smoke immediately subsided, and the vapor exuding from the chimney was scarcely perceptible, the beneficial action of the invention being instantly restored. This experiment was very interesting and satisfactory, as it exemplified at once the facility with which the smoke may be consumed. Mr. Salkeld, one of the firm, stated that he would not be disposed to return to the old plan of furnaces, but that he would, in setting new boilers, be disposed to adopt smoke-consuming apparatus; and from the experiments that had been tried on the premises, he would give the preference to the plan of Mr. Lee Stevens, which he was then having applied to another boiler." "I have visited several other establishments, but the results are so similar to the above in general statistics that only one other need be mentioned, that of—

Mr. W. R. Shaw, leather manufacturer, Wyld's rents, Bermondsey. "At this place I found they consume such refuse as tan, leather shavings and cuttings, &c., with about one-fourth of coal. The smoke arising from such fuel was not only dense, but the odor was extremely disagreeable when burnt on the old plan of furnace; but by the adoption of the smoke-consuming apparatus of Mr. Lee Stevens, the opacity of the smoke was removed, and the smell also—the gases being more perfectly converted to the production of heat."

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, May 18, 1854.

John P. Parke, Esq., President, pro. tem., in the chair.

John F. Frazer, Treasurer.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

Donations to the Library were received from John T. Clark, Esq., Albany, N. Y.; The Lyons Manufacturing Co., City of N. York; Thos. Ewbank, Esq., Washington City, D. C.; G. H. Hart, Esq., Penna. Legislature, and from Messrs. Chas. Ellet, Jr., Fred. Graff, J. D. Whitney, Foster & Whitney, Dr. L. Turnbull, Lieut. Jas. H. Bulkley, and Samuel Sloan, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute were laid on the table.

The Treasurer read his statement of the receipts and payments for April.

The Board of Managers and Standing Committees reported their minutes.

On motion, the Committee on Exhibitions were instructed to take the necessary steps to hold an Exhibition of American Manufactures next Fall, agreeably to their recommendation this evening.

New candidates for membership in the Institute (3) were proposed, and the candidates (8) proposed at the last meeting were duly elected.

Dr. Rand exhibited a model of the form of lightning rod proposed by Mr. J. L. Gatchell, and explained that no novelty was claimed for the rod, except the combination in one of all the means which experience and theory had shown to be most effective in producing the required protection. The rod terminates above in a platina point, secured upon a similar point upon the rod itself, and surrounded by a brush or row of copper points (as proposed and applied by Dr. Hare,) pointing outwards at an angle of about 45°, and secured at their bases into a ball of zinc screwed or soldered upon the rod; this combination of metals being used to prevent the rusting of the copper. The separate joints of the rod are to be secured by screwing, and pass through glass insulators, (not, as the inventor states, from any impression of the practical importance of such insulation, but in deference to the time-honored prejudices of the people.) At the lower end, again, the rod terminates on the level of the ground in a zinc ball, from which a number of copper rods pass down to water. This arrangement being adopted to prevent the rusting off of the rod, which not unfrequently takes place where iron is used just below the surface of the ground.

Prof. Frazer took the opportunity now afforded at the opening of the season most abundant in thunder-storms, to call the attention of the members to the true theory of the protection afforded by the lightning rod, which, notwithstanding all that had been done on the subject, seemed to be less understood among us than in the days of Franklin. He cited the experiment of Prof. Henry, *Proceedings Am. Phil. Soc.*, vol. iv, p. 265,)

by which it was shown that the rod was under the influence of the approaching cloud while yet at a great distance, (20 miles,) and hence showed the value of Dr. Hare's brush, which presents points directly towards the approaching cloud, whilst the upright extremity of the rod is prevented from acting. He also called attention to the great importance of a perfect conducting medium between the point and the moist earth, since the current through the rod, at the commencement of the action, must be exceedingly feeble, and therefore liable to be interrupted by the slightest break. This he considered as the prominent defect in the rod of Mr. Armitage, at least as put up in this neighborhood. The same fact of the inductive action of the rod while the cloud was at a great distance, and the consequent feebleness of the current produced, explained the importance of having a sufficient cross-section of the conductor, and the fallacy of depending upon mere surface; for although it appears that electricity of tension passes exclusively on the surface of conductors, (Henry, *Proc. Am. Phil. Soc.*, vol. iv, p. 179,) yet the galvanic current, which more nearly resembles the case under consideration, passes more freely as the area of cross-section is increased. He also called the attention of the members to the cases where a lightning rod has been known to be struck, that is, to receive a perceptible spark; and doubted whether in every case where this had been seen, a careful examination would not show a want of perfect conduction somewhere in the apparatus, and a consequent loss of the first and important inductive influence of the rod. This interruption he explained as most likely to occur by the rusting of the rod just below its entrance into the ground, and therefore considered the modification shown to-night as an improvement, inasmuch as it tended to prevent such an accident.

In reference to the insulation of the rod, Prof. Frazer considered it as entirely unimportant, except in cases where the building contained masses of metal, which should always be connected with the rod, in order to prevent the lateral shock.

Dr. Henry Hartshorne made the following remarks on the use of hydrogen as a calorific agent: The practicability and convenience of cooking and warming rooms or houses by gas, has been proved by numerous and sufficient trials. Its advantages over the ordinary employment of anthracite are obviously immense, except in the one item of *expense*. Those interested in the subject, have, therefore, been waiting in anticipation of a possible reduction in the price of gas. According to a calculation based upon statements made by Mr. Mayer, who has devised and put in use an excellent gas-cooking apparatus, it would require the reduction of gas to *one-half* its present cost to the consumer, in order to make its use in ranges and stoves as economical as that of coal. If gas were but $1·00 per thousand feet, the end would be gained.

But instead of reduction, a proposition has been recently made in the City Councils to *increase* the price of gas, on account of the greater present expense of the materials from which it is made. In view of this fact, and of the very high price of the coal used for domestic purposes, two questions are very naturally suggested: 1. Can a *cheaper* quality of the ordinary luminous gas be made, containing less carbon, and therefore unfit for light, but well adapted for calorific use? 2. If that be impracti-

cable, cannot some *other* gas be substituted for this purpose, as, for instance, hydrogen?

If either of these inquiries may be answered in the affirmative, it will have an important bearing on the interests of all householders. For, if light is an object of consequence, heat is still more indispensable; if light ever has been and must be expensive, heat for cooking and warming our domicils must ever require a still greater expenditure. The contrast between the old-fashioned, dull, and disagreeable glimmering of oil lamps and the delightful convenience of gas, is not by any means so great as would be the change from the time-reconciled use of coal-bins, coal-scuttles, shovels, and ash barrels, to the clean and comfortable substitute of simple gas-burners arranged in Mr. Mayer's stoves.

Putting aside, for the present, the question as to the possibility of making a cheap hydro-carbonous gas for heating purposes, let us consider the subject of hydrogen, as this gas is known to produce more heat in burning than any other substance.

There are at least three ways of manufacturing hydrogen gas.

1. By decomposing water through the means of the voltaic battery.
2. By the action of dilute sulphuric acid upon zinc or iron filings.
3. By passing the vapor of water over iron filings heated to an intense redness, or over coke.

The first of these methods has, perhaps, the greatest scientific beauty. Take, for example, a Bunsen's battery of a large number of cells; immerse the wires in water, the vessel containing which is divided by a septum into two parts; at the one pole will be given off hydrogen—at the other oxygen gas, in the proportion of two volumes to one. The gases may be collected in separate reservoirs, and rejoined in a jet at the desired place, on the plan of Dr. Hare's compound blow pipe. The most intense heat can thus be generated.

Unless, however, as Prof. Frazer has suggested, some improvement in the adaptation of the battery be obtained, so as to make the residue of the process available in some way, this plan of producing heat appears to be outside of the pale of *economy*.

With regard to the second method, the same objection would probably apply; a considerable amount of zinc or iron, as well as of sulphuric acid, being consumed in the process, and the resulting compound having but little value.

As to the third method, Dr. Kennedy informs us that in some parts of New England, hydrogen gas is manufactured by passing steam over heated iron filings, in order to *dilute* a luminous gas made from rosin. The substitution of coke for the iron filings has been devised by M. Gaillard, of Paris, who constructed a burner in which a jet of hydrogen made luminous a platinum wick; and the expense of this process, apart from the platinum, Dr. Rand believes to have been but 30 cents per thousand feet. The experiment has been repeated, in part at least, at the gas-works in this city. Now, if the cost of hydrogen used as a calorific gas be but 30 cents per thousand feet at the gas-holder, it will be an interesting inquiry easily solved by those familiar with gas manufacture, at what cost the same gas can be furnished, through main, pipes, and metres, *to the consumer*?

This, therefore, is the question intended to be suggested by these remarks; and, with a view of eliciting important information with regard to it, I make the following distinct proposition:

I propose, as the most convenient and desirable mode of supplying heat for cooking and warming purposes, the use of *hydrogen gas*, manufactured by passing the vapor of water over coke at a sufficient temperature, distributed through apparatus similar to that now in use for luminous gas, and applied by means of stoves, heaters, and ranges of such construction as shall prove, upon trial, to be the best.

I submit that if this can be done at a cost to the consumer of not more than $1·00 per thousand cubic feet, it will be equal in economy to the ordinary use of anthracite, and vastly superior in comfort, cleanliness and convenience. One very great advantage, affecting even the health is, that hydrogen produces *only water* in burning. The objection apparent at first sight in regard to the necessity, were such a plan approved, of creating new works, pipes, metres, &c., for the calorific gas, in addition to those already laid for the luminous carbo-hydrogen, is really null. The whole matter turns upon the question of expense. If it *pays*, it should be done, precisely as all who can afford it have pipes with warm water to supply their bath rooms, with none the less readiness because they already have had cold water pipes in the same place.

The remarks gave rise to an interesting discussion, which was participated in by Prof. Frazer, Dr. Rand, Dr. Hartshorne, Dr. Kennedy, and Mr. Williams. At the request of Dr. Hartshorne, the subject was referred to the Committee on Science and the Arts for investigation.

BIBLIOGRAPHICAL NOTICE.

Field-Book for Railroad Engineers, containing Formulae for Laying out Curves, determining Frog Angles, Leveling, Calculating Earth Work, &c., &c.; together with Tables of Radii, Ordinates, Deflexions, Long Chords, Magnetic Variations, Logarithms, Logarithmic and Natural Sines, Tangents, &c., &c. By John B. Henck, A. M., Civil Engineer. New York: D. Appleton & Co.

We quote at full length, as the most convenient mode of announcing its aims and contents, the title page of a pocket volume just issued from the press. The growing importance of the engineering profession in this country, and the numbers engaged in it or aspiring to its honors, are well indicated by the works of this character which have been published of late years for their especial convenience. Those of Haswell, Scribner, and Trautwine, may be particularly mentioned as useful works, all like this, in pocket form.

Mr. Henck's book is evidently by a practical man, who understands the wants of the profession. It has much merit, and we commend it cordially, not only to beginners, who will find it an excellent text book, but also to experienced assistant engineers, as an admirable compendium of rules and tables, which will save them a great deal of trouble in the field, as well as the office. We know of no single book which could supply its place. E. M.

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